BOTANICAL DIALOGUES.

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[PRICE 7s. 6d. IN BOARDS.]

BRITISH MUSEUM

BOTANICAL DIALOGUES,

BETWEEN

HORTENSIA AND HER FOUR CHILDREN,

CHARLES, HARRIET, JULIETTE AND HENRY.

DESIGNED

FOR THE USE OF SCHOOLS,

BY A LADY.

" *If we give our children nothing but an amuſing employment, we*
" *loſe the beſt half of our deſign; which is, at the ſame time*
" *that we amuſe them, to exerciſe their underſtandings, and to*
" *accuſtom them to attention. Before we teach them to name*
" what *they ſee, let us begin by teaching them* how *to ſee.*
" *Suffer them not to think they know any thing of what is merely*
" *laid up in their memory.*"

ROUSSEAU'S LETTERS ON BOTANY.

LONDON:

PRINTED FOR J. JOHNSON, IN ST. PAUL'S CHURCH-YARD.

1797.

Dr Darwin in his Plan for
the Conduct of Female Education
mentions this Book to be the
production of M. E. Jackson.

BRITISH MUSEUM

ADVERTISEMENT.

THE Authoreſs of the Botanical Dialogues hopes that the following Letter, which ſhe is kindly permitted to publiſh, will ſecure her from the charge of temerity in preſenting her work to the public, which ſhe does with unfeigned diffidence, although with the hope that her endeavours to render the ſcience of Botany a more amuſing and leſs difficult ſtudy to young people, than it has hitherto been found, may not prove wholly ineffectual.

Derby,

29 AU 62

Derby, Aug. 24, 1795.

Dear Madam,

According to your deſire, Sir Brooke Boothby and myſelf have been agreeably buſied for many days in reading and conſidering your Botanical Dialogues for Children; and much admire your addreſs in ſo accurately explaining a difficult ſcience in an eaſy and familiar manner, adapted to the capacities of thoſe, for whom you profeſſedly write; and at the ſame time making it a compleat elementary ſyſtem for the inſtruction of thoſe of more advanced life, who wiſh to enter upon this entertaining, though intricate ſtudy. We think therefore, that not only the youth of both ſexes, but the adults alſo, will be much indebted to your ingenious labours, which we hope you will ſoon give to the public.

We beg to ſubſcribe ourſelves, with true regard,

Dear Madam,

Your obedient Servants,

BR. BOOTHBY.

E. DARWIN.

29 AU 62

29 AU 62

EXPLANATION OF PLATE I. PART I.

OF THE SEVEN PARTS OF FRUCTIFICATION.

Fig. 1. The parts of Fructification of a Crown-imperial. Fritillaria-imperialis.

a, a, a, a, a, a. The Petals.

b, b, b, b, b, b. The Stamens.

c, c, c, c, c, c. The Anthers.

d. The Germ.

e. The Style.

f. The Stigma.

Fig. 2. A Petal and Stamen of Crown-imperial. *g*, the Nectary. *h*, the Anther ſcattering its Duſt.

Fig. 3. The Pericarp of Crown-imperial cut acroſs to ſhew the three Cells.

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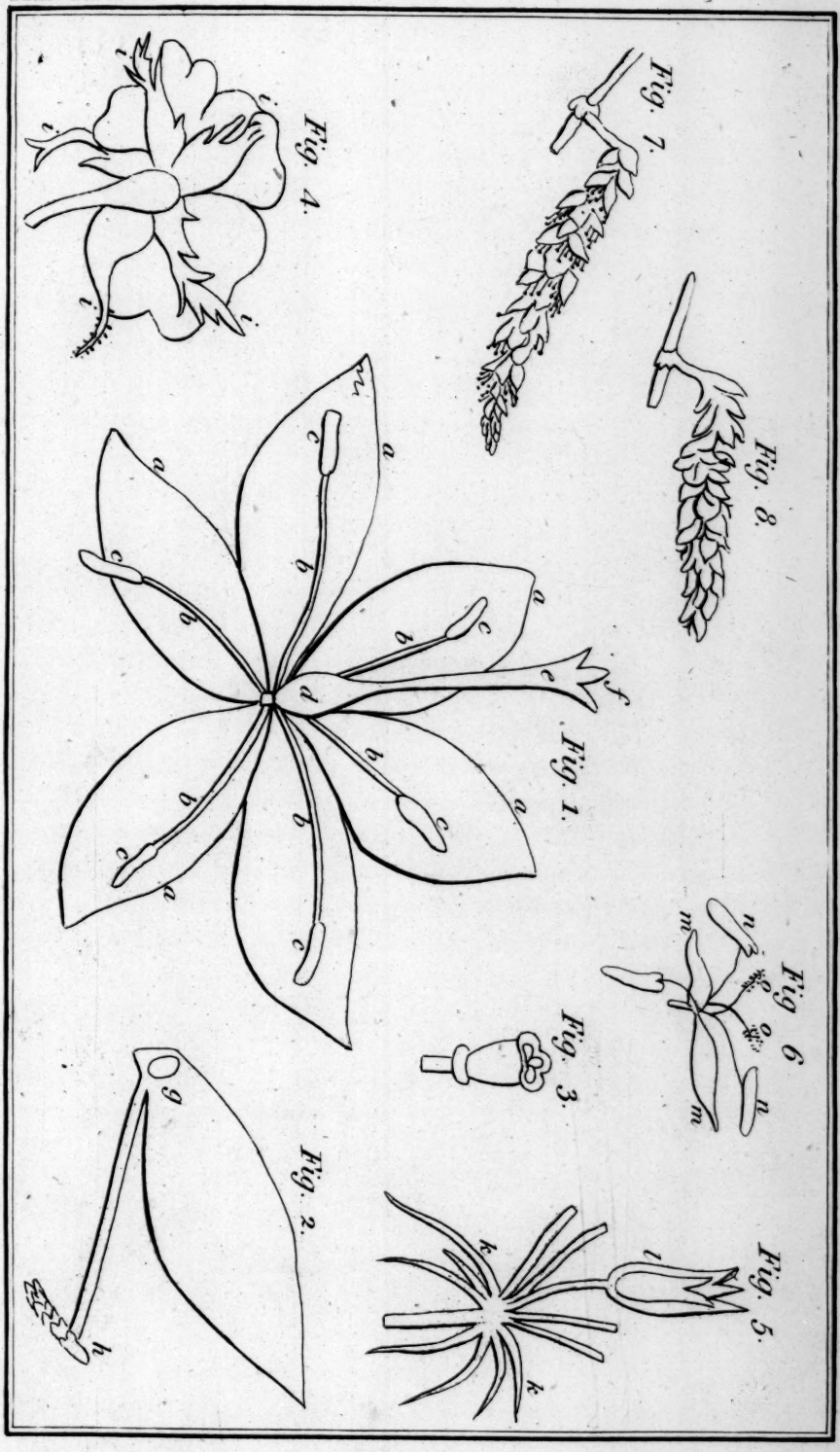
Fig. 6. A Flower of Graſs. *m*, the Glume. *n*, the Stamens. *o*, the feather'd Stigmas of the Piſtils.

Fig. 7. A Male Ament, containing the Stamens only.

Fig. 8. A Female Ament, containing the Piſtils only.



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ANALYSIS OF THE FIRST PART

OF THE

BOTANICAL DIALOGUES,

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ANALYSIS OF THE SECOND PART.

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degrees of maturity. Arum, a plant of extraordinary ſtructure. Nature not limited in her modes of re-production. 220, Singular ſituation of the ſtamens of Arum, reſpecting the Piſtil. Stamens a collection of Anthers only. Nectaries of Arum. Seeds of Arum. Opinion of the younger Linneus of the claſſic character of Arum. 221, Roots of common Arum extremely acrid; eaten by thruſhes; the roots of ſome ſpecies made uſe of as food; the leaves of ſome ſpecies boiled and eaten. Starch made from the roots of Arum Maculatum; injurious to the hands which uſe it. 222, All parts of the plant acrid. Dangerous conſequence of taſting plants, the qualities of which are unknown to us. Mercuriális Perénnis, a good ſpecimen of the claſs Two-houſes. Deſcription of the flower of Mercuriális. Hydrócharis eaſily referred to its Genus. 223, The leaves and whole ſtructure of Hydrócharis exceedingly curious. Singularities of the ſtamens explained. Nectaries obſerved, by Mr. Curtis, on the piſtil, not noticed by Linneus. 224, Spathes of the flowers of Hydrócharis appear full of bubbles. Mr. Curtis's account of Hydrócharis differs from that of Linneus. Flowers of Typha, or Cat's-tail, difficult of inveſtigation. Mr. Curtis does not wholly agree, in his account of them, with Linneus. Mr. Curtis's account to be relied on. 225, Flowers of Typha deſcribed. Suppoſed calyx, of Linneus, hairs which cover the receptacle after the ſtamens are fallen off. Spikes of flowers Aments, or Catkins. Cylindric form of the ſpikes marks the Genus Typha. *Culm*, the Linnean term for the ſtraw of Graſſes. Difference of poſition of the male and female flowers on the *Culm*. Magnificent appearance of the flowers of Typha Major; every part of the plant worthy of attention. 226, Species of Cárex not eaſily diſtinguiſhed from each other. Carex Péndula diſtinctly marked by the long pendant Aments of its flowers. The Catkin tribe of flowers merits attentive examination; manner of inveſtigating Ament-bearing plants. 227, Cryptogámia

togámia claſs. Brown ſpots on the under ſide of the leaves of Fern, a moſt important part of the plant. Plants of the Fern-tribe wonderfully conſtructed. Stamens and piſtils not yet diſcovered in the Cryptogamian claſs. Meaning of the term Fructification, as applied to the plants of Cryptogamia. The Fílices, or Ferns, divided into three ſections, by the diſpoſition of their fructifications. Radical fructification explained, well ſeen in Pilulária. 228, Hedwig's botanical reſearches, in claſs Cryptogamia, of great importance. Equiſétum Sylváticum, a good ſpecimen of the ſpiked fructification of Ferns. Extraordinary appearanee of the ſuppoſed ſeeds of Equiſétum; magnified, draws a great aſſiſtance in the inveſtigation of obſcure plants. Plates not wholly to be relied on. Little progreſs made in any ſtudy by thoſe who rely on the authority of others. 229, Diffidence proper in young perſons. Method of ſtudy recommended to them. The rule, 'See for yourſelf,' to be obſerved in all ſtudies; Mr. Curtis's works rendered valuable by the obſervance of this rule. 230, Inconvenience ariſing from reliance upon authority. Candid correction of the few errors of Linneus, of eſſential ſervice to the botanical world. Queſtions, properly aſked, not impertinent. Account of the progreſs of Equiſétum. 231, Greeniſh powdery maſs ſhook from the ſpike. Particles of powder appear regular formed bodies, viewed in the microſcope; account of their form. Regular organization of the parts of plants. Curious appearance of the powder ſhook from the ſpikes of Equiſétum. Hedwig's opinion of this powder; circumſtance in favour of his opinion. Scales of the protruded ſpike of Equiſétum, protected the ſpikes before protruſion. 233, Knowledge of the fructification of Equiſétum leads to the knowledge of the fructification of other ſpiked Ferns. Leafy fructification; beauty of the maiden hair. The parts of fructification too minute for the inveſtigation of young botaniſts. The larger ſize of Hart's-tongue, ſhews the fructification diſtinctly.

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234, Fructification deſcribed; wonderful mechaniſm of the ſeeds, with their apparatus. Benevolence of nature in all her works. Mechaniſm of the capſules of Fern. 235, Seeds produced by a plant prove that it poſſeſſed other parts of fructification. Difficulty of viewing the capſules of Fern through a microſcope. Capſules opened by the warmth of the breath. 236, Have the appearance of being alive; dextrous management, and patience required in viewing them. Arts by which inſtructors of youth may induce their pupils to attend to their ſtudies. Polypódium Vulgare. 237, Root of Polypódium Vulgare reſembles the large kind of caterpillars. Error in the deſcription of Polypódium Vulgare by eminent botaniſts; aſcribed by Mr. Curtis to too great deference to authority. Error of Tournefort in delineating the capſules of the Polypódium Genus without rings; one of the many inſtances of the fallacy of authority. 238, Polypódium Vulgare appears deſtitute of the membrane by which the capſules of all the other ſpecies are encloſed. The Fern tribe opens an ample field of diſcovery to modern botaniſts. Education of women ſhould not be ſuperficial; public diſtinction not advantageous to women. 239, Improvement of the world favourable to the exertion of female talents. Domeſtic occupations the peculiar province of women; beſt fulfilled by women whoſe underſtandings have been cultivated; liberal education of females diſtinguiſhes them, at preſent, above their companions; liable, from ſuch diſtinction, to render them vain; danger of vanity decreaſed by liberal education becoming general. 240, Practice can alone make us acquainted with the different Génera of Ferns. Similarity of their fructifications. Capſules variouſly placed on the fronds; preciſe géneric character not eaſily attained. Plates and remarks of Mr. Curtis, in his London Flora, particularly uſeful in the ſtudy of Ferns. 241, Roots of Oſmúnda Spicant reſemble the large kind

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of caterpillars. Ferns ornamental in all ſituations. Groups of Cryptogamia plants beautiful in winter.

DIALOGUE THE FOURTH. From Page 242 to 283.

Page 242, Moſſes, a tribe of plants little underſtood; beauty and uſe of Moſſes. The opinion that they impoveriſh the ground on which they grow, erroneous. Roots of Moſſes penetrate little way into the earth. 243, Fuel, called Peat, formed from the roots of Moſs. Peat-fuel not, excluſively, derived from Moſs. Whole trees enter into the compoſition of a Peat-bed. Moſs retains moiſture a long time, without becoming putrid; its uſe to gardeners. 244, The diſtinct fructifications of Moſſes well eſtabliſhed ſince the time of Linneus; their ſituation not yet determined. A reviſal of the works of Linneus deſirable. Claſs Cryptogamia improved ſince his time. Génera of Moſſes diſtinguiſhed by their outer habits, and ſituation of their capſules. Reſemblance of Moſſes to the Pine tribe; ſlowneſs of their growth. 245, Difference in the leaves of Moſſes. Male and female flowers placed ſeparately. Calyx, termed by Linneus Calyptre. From the preſence or abſence of the Calyptre Linneus has diſtinguiſhed the Génera. Opérculum of Moſſes, a curious microſcopic object; ſhould be examined with magnified drawings. The moſt beautiful objects of nature viewed with indifference when not underſtood. 246, Parts of the fructification of Moſſes may be ſeen, in an early ſtate, with the aſſiſtance of glaſſes. Hedwig's diſcovery of the difference betwixt the leaves of the plant, and thoſe which form the fructification buds; eſteems the bud-leaves true involúcres; encreaſe in ſize as the capſules grow towards maturity. Hedwig's reſearches promiſe great information on the ſubject of Moſſes. His reſearches not of much uſe to young botaniſts. Mr. Curtis's figures and deſcriptions

ſcriptions accurate and plain. Mr. Curtis does not venture to decide whether the powder contained in the capſules of Moſſes is anther-duſt or ſeed. Hedwig aſſerts that the capſules are true ſeed veſſels. 248, Young plants raiſed from the capſules of Moſſes, by Hedwig; ſowed, by Dillenius, without ſucceſs. Cauſe from whence theſe different reſults of the ſame experiment may ariſe. The parts of the ſuppoſed fructification muſt be well underſtood before we reaſon upon their uſe. Deſcription of Curled Bryum. Hedwig's obſervation upon the expanſion and contraction of the fringe of the capſule in dry and moiſt air; cloſes, even from the moiſture of the breath. 249, Curious mechaniſm of the capſule of Moſſes; contents of the capſule protected by the fringe found under the Calyptre. Calyptre of Bryum Undulátum deſcribed. Mechaniſm of the ſuppoſed fructifications of Moſſes and Ferns equally curious; both ſeem formed for the protection and diſperſion of their ſeeds; the manner in which the ſeed is produced unknown, unleſs Hedwig's reſearches may be relied on. 250, Magnified leaf of Bryum Undulatum ſhews its undulated edges. Bryum Undulatum produces its capſules from November to February; ſituations in which it is found. The leaves curl up ſoon after the plant is gathered; method of examining the plant. Bryum Hornum placed by Linneus among the Mniums; diſtinguiſhable from Undulatum by its bending peduncles. 251, Star-like appearance on Moſſes ſuppoſed, by ſome authors, to be the piſtil-bearing parts of fructification. Various opinions reſpecting theſe ſtars; conjecture reſpecting theſe ſtars. An outline of the opinions of eminent botaniſts on the claſs Cryptogamia ſhould be given to botanical pupils; admits only of conjecture. 252, Hedwig's opinions muſt be juſtified by experiments before they are fully aſſented to. Inveſtigation of the Cryptogamia claſs impeded, perhaps, by too ſtrict adherence to the enquiry after reproduction from ſeed. May not the ſuppoſed ſeeds of Moſſes be bulbous pro-

progeny? Bryum Hornum produces capſules from February to March. Peculiar appearance of the capſules of Bryum Trunculatum. 253, One of the leaſt of the Moſſes, diſtinguiſhable by its great number of little brown capſules, from September to February. Bryum Trunculátum and Virídulum known from each other by the form of their capſules. A knowledge of the outer habit and ſtructure of Moſſes ſhould be attained by botanical ſtudents. 254, Regular experiment can alone lead to diſcoveries of importance. Hypnum and Bryum Génera diſtinguiſhed, by Linneus, from the ſituation of their peduncles. The part, termed Anthers by Linneus, now known by the name of capſule. Singular ſtructure of the leaves of Hypnum Proliferum, found by Linneus under the ſhade of thick woods. 255, Rare appearance of fructification in Hypnum Proliferum. Time of fructifying, from December to February. Structure of capſules nearly the ſame in all the Moſſes. Peculiarities, diſcovered by Mr. Curtis, in the capſules of Bryum Subulátum and Polytrichum Subrotúndum. The uſe of theſe peculiarities not underſtood. 256, Great nicety requiſite in making experiments. 257, Curious and beautiful ſtructure of the capſules of Polytrichum Subrotundum diſcovered to be a conſtant mark of the Genus. Structure of the capſules deſcribed. 258, A cheap publication of the figures of the plants of claſs Cryptogamia, with deſcriptions of them, given by Mr. Curtis, would be a work of extenſive benefit to the botanical world; his London Flora too expenſive for general uſe. 259, Polytrichum Pilóſum made uſe of for beds, by the inhabitants of Lapland; curious method of preparing theſe beds. 260, Reflections on the wants of others, ſhould render thoſe who are placed in happier ſituations, contented and chearful under ſlight inconveniences. Algæ, or Flags, not treated of by Mr. Curtis. The root, ſtem, and leaf of Algæ ſcarcely admit of diſtinction. 261, Deſtitute of obvious flowers; manner of diſtinguiſhing the Génera. Algæ of great importance

portance in the economy of Nature; vegetate upon the bareſt rocks. Lichen Paſcalis found by Dr. Smith on a torrent of hardened lava; peculiarly fitted for the beginning of vegetation on a hard ſurface. Thread-form Lichens inſinuate their roots into crevices of the barks of trees. Cruſtaceous kinds vegetate on ſmooth ſurfaces. 262, Proceſs of Nature in forming vegetable mould apparent upon the ſmooth and barren rocks upon the ſea-ſhore; account of the proceſs. Lichens made uſe of in dying; fed upon by goats and rein-deer. 263, Cup-moſs, a Lichen. Numerous ſpecies of Lichen difficult to diſtinguiſh. Hedwig's inveſtigations of them; his opinion of their parts of fructification. Fringes from Lichen Céliáris put forth roots; diſtinct from the ſuppoſed parts of fructification. Hedwig's plates of the Algæ tribe. Algæ not well underſtood. Sea-wrack, a Fucus. 264, Prolific property of the leaves of Fúcus Veſiculous. Black hair-like tufts found growing upon Fúcus, a Conférva. Some ſpecies of Fúcus, perhaps not true vegetables. Sea-anemóne falſely eſteemed a vegetable. Green films on water and on trees not thoroughly underſtood. Claſs Cryptogamia requires new arrangement. 265, Génera of the third order diſtinguiſhed by no obvious common character; peculiarities of them worth attending to. Beauty of the Lichens. White Moſs, on heaths, Rein-deer Lichen; many varieties of it; diſtinction between them and the true ſpecies. 266, Moſs on trees a Lichen. Lichens, Moſſes, Ferns, and Funguſes, form a complete winter garden. Funguſes eaſily diſtinguiſhed from each other by the attentive ſtudy of good plates. Generality of Funguſes not offenſive either to the ſmell or taſte. Much information gained, concerning them, within the laſt twenty years; not yet perfectly underſtood. 267, Hedwig's reſearches into the Fungi tribe, ſuppoſed, by him, to poſſeſs ſtamens and piſtils. Curtain of Funguſes, not found in every ſpecies. Curtain deſcribed. Hedwig's account of the ſuppoſed piſtils. 268, Seeds of Fungi. Globules uniformly

found in the Génera Agáricus and Bolétus believed, by Hedwig, to be ſtamens. A diſtinct knowledge of plants which preſent themſelves daily to our eyes, agreeable to attain. 269, Parts which can be ſeen only with powerful magnifiers cannot be uſed for the diſtinction of Génera. Excellence of géneric characters to be obvious and clear. Fungi continue their ſpecies by a powder which is viſible in the gills of many of them, generally allowed to be ſeed. Short continuance of ſome of the Agáric ſpecies. Inveſtigation of an Agáric. Genus Agáricus deſcribed; three firſt diviſions of the Genus founded on the poſition of the ſtipes. 170, Diſtinction betwixt the Volve and Curtain, explained by Mr. Bolton. Erroneous account of the Volve, by Linneus. Under the Curtain of Fungi the parts of fructification found, by Hedwig. Ring of Funguſes formed from the remnants of the Curtain. Ring uncertain in its appearance; cannot be uſed for a permanent mark. Stem of Agáricus either ſolid or hollow; varies much in its degrees of ſolidity. 271, Colour of the gills varies in different ſpecies; vary much in their reſpective lengths. Seeds formed between the membranes of the gills. Situation of the gills. Peculiarity of ſtructure diſcovered, by Mr. Curtis, in the gills of Agáricus Ovátus; uſe of that ſtructure. 272, Secondary ſubdiviſions of the Agárics, on what founded. Gills a part of great importance; various appearance of the gills; colour of the gills not liable to vary. Character of the ſpecies taken from the colour and ſtructure of the gills. Colour changes when the plant begins to decay; colour muſt be obſerved in their firſt ſtate of expanſion; colour of the flat ſide of the gills, that which muſt be attended to. 273, Hat of the Agárics, the part leaſt to be depended on. Viſcous juice of the hat depends on the ſtate of the atmoſphere. Acrid juice in Agárics, not conſtant. 274, Structure of Agáricus nearly the ſame as that of the other Fungi Génera. Dr. Withering's arrangement of the Fungi. Exception to the uniformity of colour

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in the gills, in Agáricus Auránticus. Beautiful colours of the Agárics. Agaricus Cæſareus the moſt ſplendid of the Agárics; a rare plant in Britain, common in Italy. 275, Agáricus Campéſtris, the fungus moſt commonly eaten in England; method of propagating it. Caprice of mankind in their choice and rejection of food. All kinds of fungi uſed for food by the Ruſſians. 276, Doubtful whether the common muſhroom be poiſonous, if properly prepared. Many vegetables rendered wholeſome by fire. Neceſſitous ſituation of the inhabitants of northern climates. 277, Make uſe of the inner bark of the Pinus Sylvéſtris for food. Method of preparing it for bread. Swine fattened upon pine-bark bread. Advantages derived from the knowledge of the properties of fire. 278, Pride and folly of conſidering the creation for the uſe of man only, numerous tribes of inſects ſuſtained by the Fungi. Extenſive uſe of the Pinus Sylvéſtris. Scoth fir; roots of Scotch fir uſed in the Scotch Highlands for candles. 279, Ropes made by fiſhermen of the inner bark. Pinus Sylvéſtris the only ſpecies of fir which grows naturally in Scotland. Oil extracted from the cones of Scotch fir; lives to a great age; profuſe in Anther-duſt. Powder which flies from puff-ball, believed to be the ſeeds. 280, Appearance of this powder when viewed through a microſcope. Puff-ball, the Lycopérdon Boviſta of ſome Authors. Species of Fungi not diſtinctly underſtood. Truffle and Morel, different ſpecies of Fungi. Truffles, Tuber Cibaria, grow underground; dogs taught to hunt them; dug up by pigs in Italy. 281, Mould a regular plant; its parts diſtinctly ſeen through a microſcope. Thirteen different ſpecies of the Múcor Genus. 282, Golden Múcor, ſtains the fingers yellow, when touched; commonly found on the Genus Bolétus; repels moiſture. The hiſtory of the plants of Cryptogamia intereſting. The knowledge of Graſſes an important branch of the ſcience of botany. 283, Farming, a uſeful purſuit to a gentleman, as it employs himſelf and the poor.

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Page 284, The knowledge of the outer habits of the Cryptogamia plants ſufficient for young botaniſts. Inveſtigation of the Génera made eaſy by plates of low price. 285, Lichen Candelárius, Golden Lichen, well figured by Sowerby; his numbers of Britiſh plants a uſeful and agreeable publication. The Graſs tribe requires a particular mode of inveſtigation. 286, Without energy nothing can be learnt. Vague idea conveyed by the vulgar term Graſs. 287, Graſſes imperfectly underſtood until late years. Names by which they have been diſtinguiſhed not in general uſe; ſubject greatly elucidated by Mr. Curtis; his practical obſervations on Britiſh Graſſes; uſeful knowledge to be acquired from that work. 288, Graſſes form one of the natural orders of Linneus. Corn arranged under the ſame order. Similarity in the parts of fructification of Graſſes. Striking agreement in their outer habits. Whole claſs characterized by ſimplicity of ſtructure. 289, Seed of Graſs does not divide into lobes when it germinates; termed, by Linneus, One-cotylédoned; the huſk of the ſeed may be ſeen adhering to the fibres of the young plants of wheat. 290, Peculiarities of Graſſes ſhewn in Alopecúrus Praténſe, Meadow Fox-tail; better ſeen in the plant than in plates. London Flora amuſing and informing on Graſſes. Leaves and ſheaths of Graſſes often furniſhed with briſtles. Specific characters taken from the preſence or abſence of briſtles. Parts of fructification not noticed by common obſervers. 291, Beauty and ſtructure of thoſe parts worthy of the higheſt admiration. Natural character of the flower of Graſſes. Ariſta of Graſſes. Awn of barley particularly ſtrong; not conſtant in every ſpecies. Corol of Graſſes termed *glume*. 292, Diviſions of the outer glume often mark the Genus. Difficulty of diſtinguiſhing the calyx from the corol. Botanic terms ought to be made uſe of. Calyx and corol to be underſtood

according to the definition of Linneus. Nectary of Graſſes diſtinctly ſhewn in Mr. Curtis's plates; not difficult to be ſeen in the natural flower. 293, May be ſeen at the baſe of the germ in wall barley; nearly reſembles the corol; furniſhes no géneric diſtinction. Three ſtamens, the number commonly found in Graſſes. Two piſtils. Exceptions to this number. Styles beautiful; ſeen with advantage through a microſcope. 294, Cloſe ſpiked Graſſes do not ſhew their fructification well. Seen well in feather-graſs. Should be examined before the Anthers have diſcharged their duſt. The flowers of Graſſes have no ſeed veſſels. Seeds emitted from the calyx in various ways. Seeds of feather-graſs diſperſed by the twiſting of their awns. Receptacle of Graſſes. The ſtem lengthened out. Awns of feather-graſs twiſt after they have been gathered. 295, Spikes of quake-graſs ornamental in dreſs; derives its name of quake-graſs from the tremulous motion of its peduncles. The parts of fructification obvious in quake-graſs. Bríza Máxima. 296, Wilful ignorance the only kind of which we ought to be aſhamed. Characters of fructification nearly conſtant in Graſſes of the Triandria claſs. Strict adherence of Linneus to the claſſic character of Graſſes. 297, Hólcus Lanátus placed in the claſs Polygamia. Greatneſs of the works of Linneus a juſt excuſe for the few errors contained in them. Variation of the number of ſtamens not uncommon in ſeveral ſpecies of Graſs; inconſtant in their variation. Strict adherence to the claſſic character perhaps advantageous in an arbitrary ſyſtem. 298, Anthoxánthum judiciouſly placed in the claſs Diándria from its conſtant number of two-ſtamens. No other Graſs found with two-ſtamens. Named vernal-graſs, from its early appearance in the ſpring. Much eſteemed by farmers. 299, Experiment makers in agriculture ſhould aſſociate with ſenſible practical farmers. Fragrant ſcent of hay derived from the leaves of Anthoxánthum; not the only Engliſh Graſs which is fragrant. Flowers of annual Póa ſaid to be

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ſo by Mr. Swayne. 300, Anthoxánthum, viviparous, many Alpine Graſſes viviparous. Canary birds fed on the ſeeds of Phálaris Canariénſis. Ribbon-graſs, a ſpecies of Phálaris. Genus Avéna, marked by the twiſted awn on the back of the corol. Motion of Avéna Fatua, 301, Named Animated Oat. Curious circumſtance reſpecting the ſeed of barley; may be ſaid to walk. Automaton ingeniouſly made on the principles of the awn of barley. 302, Merit of experiments depends on their uſefulneſs. Makers of experiments not ſufficiently reſpected. Mankind firſt fed upon corn by the invention of Ceres; deified by the Egyptians on that account. 303, Heathen deities often derived from mortals, from whoſe diſcoveries mankind had received benefit. Oſyris the inventor of the plough. Straw of oat the firſt muſical inſtrument. Objects familiar to us not ſufficiently reflected upon. Inventors of uſeful arts have only a ſecondary claim to gratitude. Beneficence of God ſhewn in the products of various climates. Wheat the moſt nutritive of the grains uſed for food; found in moſt parts of Europe and of Aſia. Zéa, Indian wheat, the product of the torrid zone. 304, Pickled wheat from the Weſt Indies. A ſpecies of Zéa parrots fed with the ſame wheat in a more mature ſtate. Rice of the natural order of Graſſes; ſeparated from them in the artificial ſyſtem of Linneus; chief food of the inhabitants of moſt eaſtern climates; converted into poiſon by the ſpirit extracted from it. 305, Extenſive utility of the natural order of Graſſes; their roots not deſtroyed by being trampled upon. The Flowers of plants not eaten by cattle. Admirable proviſion made by Nature for the preſervation of Graſſes. 306, The ſtructure of Graſſes to be ſtudied with a microſcope.

DIALOGUE THE SIXTH. From Page 307 to 335.

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of

of the Linnean ſyſtem. 317, Shortneſs of life ſufficient excuſe for the imperfections of ſo great a work. Children ſhould be taught to judge with reaſon. Root of plants a true ſpecific mark. Difficulty of examining the root prevents it being made uſe of as ſuch. Trunk and ſtalk afford ſtrongly marked characters. Fulcra and inflorescence furniſh permanent marks. 318, Parts of fructification ſometimes uſed with advantage in ſpecific diſtinctions. Some Hypéricums and Gentians diſtinguiſhed by their parts of fructification. Such diſtinctions agreeable from being obvious. Many other ſpecific characters equally obvious. Study of leaves neceſſary to the underſtanding the ſpecies of plants. Moſt elegant ſpecific diſtinctions formed from leaves. 319, Great variety in leaves; muſt be attentively ſtudied; method of ſtudying leaves. Form of leaves firſt to be conſidered; divided into ſimple and compound; ſimple leaf defined; ſixty-two ways in which a ſimple leaf may be diverſified. 320, Various forms of leaves muſt be ſtudied with plates of them, and terms of explanation. Genius of Linneus ſhewn in the conſtruction of his botanical language. Engliſh botaniſts much indebted to the Lichfield tranſlators of Linneus's works. Preface and advertiſement to the Lichfield tranſlation ſhould be read by botanical pupils. The knowledge of leaves may be acquired by attention. 321, Explanation of the Linnean language. Excellence of the Linnean deſcriptions. Want of preciſion in the deſcriptions of other authors. 322, Method of acquiring preciſe ideas of the different forms of leaves. Language of the Lichfield tranſlators explained; agreeable conciſeneſs of that language. 323, Compound leaf defined. 324, Compound leaf and branch known from each other by two rules. Leaves of Robínia Pſeud-acacia, a good example of the compound character. Three kind of compound leaves. 325, Great variety of compound leaves. Each modification of a compound leaf marked by an appropriate term; method of ſtu-

dying compound leaves. Idleneſs ſhould be conquered. Different modifications of the compound leaf enumerated. Fingered leaf ſeen in horſe-cheſnut and lupine. Specific characters frequently formed from the various modes of compound leaves. 326, Various forms of ſimple leaves ſhould be ſtudied before thoſe of the compound kind are attended to. Language of the Syſtem of Vegetables not intelligible until it is ſtudied. The Lichfield tranſlation the only book from which an Engliſh botaniſt can completely learn the ſcience of botany. 327, Sufficient knowledge of Latin, to enable an Engliſh botaniſt to read the Species Plantárum, eaſily acquired. 328, Determination of leaves explained. Belongs to ſimple and compound leaves equally. *Alternate* leaves ſhewn in ivy-toad-flax. *Oppoſite* leaves, in myrtle. Manner of leaves being placed on the ſtem common to the whole Genus. *Direction* of leaves explained. Various modes of direction muſt be ſtudied. *Inſertion*, a general term for the manner in which leaves are attached to plants. Each mode has an appropriate term; theſe terms well explained in the Syſtem of Vegetables. 329, Double flowers, ſome knowledge of them requiſite for young botaniſts. Term monſter, not neceſſarily expreſſive of uglineſs. Double flowers, the pride of fioriſts, the product of culture. 330, Vulgar error of gardeners reſpecting double flowers. Completely double flowers loſe their ſtamens. Various modes of vegetable monſters being produced. Calyx and lower row of petals unchangeable in double flowers. Half-double flowers bear fruit. Roſe in Roſe Polyánthos, a proliferous flower. 331, Hen and Chicken daiſie, a beautiful vegetable monſter. Extraordinary change cauſed in Roſe Plantain, by becoming double. Flowers multiply by their nectaries; become double in various ways. Parts of Mr. Roſe's Elements of Botany ſhould be ſelected for the inſtruction of young botanical pupils. Provence Roſe deſtitute of ſtamens. Damaſk Roſe does not loſe its ſtamens by becoming double.

Many-

Many-petalled flowers moſt liable to become double. One-petalled flowers rarely multiply beyond a double corol. Beauty of compound flowers encreaſed by multiplying. 332, Single flowers generally more beautiful than double ones. Various cauſes from which plants depart from their true ſpecies; culture the moſt prevailing cauſe. Fruits and veſculent vegetables derive their excellence from the art of gardening. Culture the beſt teſt of a true ſpecies. Ingenuity and induſtry of mankind conſpicuous in the culture of corn. Botaniſts ſhould attend to diſtinctions ariſing from ſeedling varieties. 333, Varieties of plants not noticed in the Syſtem of Vegetables, marked in the Species Plantárum with a capital B. Leaves ſubject to all the varieties which take place in flowers; undergo extraordinary changes in their appearance. Many changes in leaves may be effected by art. The beauties of a ſcience more agreeable to ſtudy than its defects. 334, After the outline of the Linnean ſyſtem is attained, practical ſtudy muſt make the complete botaniſt. The ſtudy of botany renders every plant intereſting. Pleaſure the conſequence of reflection. Evil effects of a bad method of education; happineſs the reſult of a good one. Objects of education, *happineſs*, *utility*, and *agreeableneſs*. 335, Philoſophy of botany may be ſtudied, after a ſyſtematic knowledge of the ſcience is attained. Philoſophy of botany the moſt agreeable part of the ſcience. Gratitude to God muſt reſult from the ſtudy of the works of Nature.

IN the pronunciation of the names of plants, *e*, at the end of Latin and Greek words is always pronounced, and not ſunk as in Engliſh. Thus, Agáve, is pronounced A-gá-ve; and Acre, A-cre.

Ch in theſe languages is pronounced like *k* in the Engliſh. Thus, Achilléa is pronounced as if it were ſpelt A-kil-le-a; and Chelóne, as if it were ſpelt Ke-lo-ne. In words ending in *ides*, the *i* is always to be pronounced long. In words beginning with *ſce* and *ſci*, the *c* is generally pronounced ſoft. In words from the Greek, the *g* ſhould be pronounced hard, as in Syngenéſia and Storge.

ERRATA.

Page	line	
19	6.	For Allyſum, read Alyſſum.
23.	15.	For Goſſypum, read Goſſypium.
24.	6.	For oxális, read óxalis.
24.	29.	For Acér, read Acer.
26.	24.	For Iléx, read Ilex.
32.	22.	For Tulípa, read Túlipa.
38.	18.	For 800, read 8000.
9.	15.	For Muſſel-ſhell, read Murex-ſhell; place the ſtop after cabinet, inſtead of after ſhell.
50.	22.	For Lavendula, read Lavándula.
52.	1.	For *is* an example, read are examples.
57.	27.	Place a ſemicolon after nature.
58.	1.	Place a comma inſtead of a period after ſuppoſe.
63.	3.	For Fritilaria, read Fritillária.
81.	23.	For Genéra, read Génera.
	24.	For *ſhe*, read *the*.
110.	20.	Eraſe *when*.
	23.	For *it is*, read *they are*.
116.	13.	For *ſeem*, read ſeems.
122.	3.	For contains, read contain.
140.	23.	For Lycopergon, read Lycopérdon.
140.	26.	For Umbraculiferæ, read Umbraculifera.
151.	7.	Put a ſemicolon inſtead of a comma, after digeſtion; a comma inſtead of a ſemicolon after fire.
154.	23.	For blot-paper, read blotting-paper.
186.	4.	For Siám, read Síum.
197.	11.	For Uned, read Unédo.
203.	6.	For Mignionelle, read Mignonette.
209.	11.	Ditto.
222.	25.	For Frog's bet, read Frog's bit.
226.	8.	Eraſe to.
227.	8.	Eraſe for, and the laſt it.
254.	14.	For Finiſhed, read Furniſhed.
305.	8.	For juſt as, read the ſame as.
232.	1.	After *oval*, read *bodies*.

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BOTANICAL

BOTANICAL DIALOGUES.

PART THE FIRST.

DIALOGUE THE FIRST.

The Seven Parts of Fructification explained.

Harriet. Now, mamma, Charles and I hope we may claim your promiſe of teaching us Botany, and that you will not any longer refuſe to fulfil it, becauſe we are idle.

Hortenſia. I ſhall fulfil my promiſe with pleaſure. I am happy to ſay, that the laſt year you have given me reaſon to be ſatisfied with your application;—and of you, Charles, your tutor gives ſo good an account, that I have no longer any cauſe to diſtruſt your induſtry.

Charles. Indeed, ma'am, you made me aſhamed, when we parted, of my idling character; and Harriet and I reſolved, that we would no more give you reaſon to ſay, that you could not attempt to inſtruct us in botany, becauſe we did not ſeriouſly apply to our more neceſſary ſtudies.

Hortenſia. Having found the advantage and pleaſure, which may be derived from an induſtrious performance of your duties, I am perſuaded, that you will not again relapſe into thoſe indolent and deſultory manners, which have given me ſo much uneaſineſs. I am not ambitious of making you ſhining characters; but I am anxious to prevent your eſtabliſhing ſuch habits, as would render you trifling ones. There can be nothing learnt; there can be no ſtrength, no dignity of character attained, where the habits are idle. I apprize you that you will not find the firſt part of the ſtudy of botany particularly entertaining.

Harriet. That we expect—I did not like learning my french grammar; but when I could read french, I was glad that I had learnt it.

Hortenſia. So you will find it with every thing; if we do not make a point of underſtanding well the rudiments, either of a language or a ſcience, we ſhall never make any great proficiency in it.—I have prepared this little room, which opens into my flower garden, for our ſtudy. Hither you may at any time come; and you will find books and glaſſes, and every thing that you may want.

We will begin our lectures this morning. I have promiſed Henry and Juliette that they ſhall be of our parties; they are never idlers either at leſſons or play, and will, I dare ſay, find both amuſement and inſtruction from the ſtudy.

Henry. We will be very attentive.

Juliette. I long to know the names of all thoſe pretty things, that we find when we pull a flower in pieces.

Hortenſ. I am a little afraid, leſt the hard names ſhould be too difficult for my younger pupils; however I will endeavour to make them eaſy.---Now for our firſt lecture.---Linneus, the great ſwediſh naturaliſt, whom I have already taught you to reſpect, has divided the vegetable world into 24 *claſſes*; theſe claſſes into about 120 ORDERS; theſe orders contain about 2000 *families*; and theſe families about 20,000 *ſpecies*, beſide the innumerable varieties, which the accidents of climate or cultivation have added to theſe ſpecies. The ſyſtem of Linneus is called the ſexual ſyſtem of botany, becauſe it is founded on obſervations, which ſeem to prove, that there are males and females in the vegetable world, as well as in the animal. The ſtamens

are termed males, and the piſtils females: theſe moſt frequently exiſt in the ſame flower, but are ſometimes in different flowers, and ſometimes even on different plants; and from their number, ſituation, and other circumſtances belonging to them, he has formed his *claſſes* and ORDERS; his *families*, or *genera*, are formed from all the parts of the bloſſom or fructification; his SPECIES, which are individuals of the families, from the leaves of the plant; the varieties, from any accidental circumſtance of colour, taſte, or odour: the ſeeds of theſe varieties do not always produce plants ſimilar to the parent, but frequently ſuch as reſemble that ſpecies, to which the parent belonged. Having given you a ſketch of the philoſophy of the ſyſtem, we will proceed to the examination of the different parts of a *bloſſom*, which now, if you pleaſe, we will accuſtom ourſelves to call the *fructification*; and pray obſerve, that I intend ſtrictly to require the uſe of the Linnean terms, as that will be a means of imprinting on your minds what you learn, and, as you grow older, will make you ready in the language of botany.

Harr. Laſt year, this would have been ſufficient to have frightened me from the ſtudy.

ſtudy. Charles will have the advantage of us, as he underſtands latin.

Hortenſ. In ſome things he may; but the language of botany may be learnt without any ſuch aſſiſtance, and perhaps more readily by not being confuſed with a knowledge of the more common ſignification of thoſe words which Linneus has appropriated to this ſcience: for inſtance, Charles will know that calyx means cup; but that will not aſſiſt him in the various ſpecies of calyxes, which he will have to retain in his memory; the common meaning of words is not ſufficiently preciſe for the purpoſe of ſcience, and cup and calyx require equal explanation, when appropriated to the particular part of a flower. The works of Linneus are now tranſlated; botany has a language peculiar to itſelf; that language is, I think, ſomewhat leſs difficult to learn than any other language, and, when learnt, introduces us to ſo delightful a ſtudy, that had I found ten-fold the difficulty that I did find in acquiring it, I ſhould think that I had ſpent my time well.

Charles. I am glad to find that I am not expected to learn more readily than Harriet, as I know that I ſhall not do ſo---But pray,

ma'am, explain to us the term *fructification?*

Hortenſ. Linneus defines it to be a temporary part of vegetables dedicated to germination; that is, all the parts of the bloſſom, which are intended for the production and preſervation of the ſeed, and which, having brought that to perfection, wither and fall off. All theſe parts, however, are not eſſential to the production of perfect ſeed, as we ſhall ſee hereafter, or are all theſe parts preſent in every flower. There are *ſeven parts* of *fructification.* 1ſt, the *calyx*; 2d, the *corol*; 3d, the *ſtamen*; 4th, the *piſtil*; 5th, the *pericarp*; 6th, the *ſeed*; 7th, the *receptacle.* The *calyx* is the termination of the outward bark of a plant; of it there are ſeven kinds; it generally appears in the form of a green cup; it's chief uſe is to encloſe, ſupport, and protect the other parts of the fructification. The firſt and moſt common kind of calyx is the Perianth; it is placed immediately under the flower, which is encloſed in it, as in a cup; primroſes (prímula) and roſes (roſa) have their calyxes of the Perianth kind. 2d, Involucre, which is a calyx, growing at a diſtance from the flower. Moſt flowers which have Involucres have alſo Perianths,

Perianths, as the prímula genus. Theſe ſlender leaves, which grow at the baſe of the numerous flower-ſtems of this polyanthos (which is a prímula) are termed Invólucres; the ſame in meadia dodecátheon, in parſley, apium, and all that tribe of plants which is termed umbelled. The plant called fool's parſley, æthúſa, by eating of which, miſtaking it for garden parſley, ſome perſons have been ſaid to be poiſoned, may be diſtinguiſhed from all other umbelled plants by the Involucres, which belong to the ſmall umbels, and which conſiſt of three long, narrow, pendulous leaves, placed at the bottom of each of them: theſe are called partial Involucres; that which grows at the baſe of the whole collection of umbels is termed the general Involucre. 3d, Glume chiefly belongs to graſſes, and conſiſts of one, two, three, or more valves, folding over each other like ſcales, and frequently terminated by a long ſtiff-pointed prickle, called the Awn, or beard. 4th, Ament is, what is commonly called a catkin; it conſiſts of a great number of chaffy ſcales, diſperſed along a ſlender thread, or receptacle, and has obtained the name of catkin from it's reſemblance to a cat's tail. Theſe Aments (we muſt

no longer call them catkins) are compoſed both of male and female flowers; what Henry calls goſlings in ſpring are the Aments of the willow tree; his green goſlings are female Aments, and, when mature, have the appearance of little tufts of wool, which appearance is cauſed by the downy material that crowns their ſeeds; his yellow ones are the males, and derive their beautiful yellow colour from the tips of the ſtamens, which contain a duſt ready to fly and to fertilize the ſeeds of the piſtils. This you will better underſtand preſently. The female Aments of the birch (Bétula) are beautiful; the tips, we have not yet learnt their ſcientific name, being of a bright crimſon, and the other part of a light green. The female bloom of nut trees is alſo very pretty, but ſo minute as generally to eſcape common obſervation.

Jul. O mamma, is it that pretty red taſſel that looks like ravellings of crimſon ſilk? Henry and I admired it yeſterday, but did not gather it; for he ſaid, perhaps it might be the nut, for that you had told him, that the catkins only made the nuts perfect, and did not themſelves *produce* nuts.

Hortenſ.

Hortenſ. He was right; but remember in future to uſe the terms of the ſcience, that you are learning. The 5th ſpecies of calyx, called a Spathe, wraps round the flower or flowers contained in it, till they are ſtrong enough no longer to require it's protection, and then they burſt forth. Sometimes the Spathe conſiſts of one piece, as you may ſee in the ſnow-drop, galánthus nivalis, and daffodil, narcíſſus pſeudo-narciſſus, and in moſt plants which have this kind of calyx; ſometimes of two, as in the Japan lily, amaryllis formoſíſſima; and ſometimes of many. I have frequently ſeen you pull off the Spathes of ſnow-drops and daffodils, and have heard you call them indian paper, which they much reſemble in their texture. 6th, Calyptre is the term for the calyx of moſſes. Calyptre is defined by Linneus to be the cowled calyx of moſs, covering the anther; which definition ſtrongly expreſſes this ſpecies of calyx; it may, however, be neceſſary to give you ſome more familiar idea: the calyptre reſembles a very ſmall extinguiſher of a candle, which covers the flower of moſs, and protects it's duſt, or ſeed, from injury: in Mr. Curtis's London Flora I can ſhow you ſome beautiful ſpecimens of this

kind of calyx; in November and December I can ſhow you the calyx itſelf.

Charles. This, Harriet, will make our walks in winter entertaining. How careleſsly we have often paſſed by the moſs bank in the wood, and complained that there were no flowers!

Hortenſ. In the ſtudy of nature you may at all times find both amuſement and inſtruction; the nice economy of all her works muſt lead the mind with praiſe and gratitude to God, who is the firſt great cauſe of all: that perſon muſt have a *dull, ſluggiſh* mind, who, ſeeing the care that is taken throughout the creation for the good of the whole, is not ſtimulated to an endeavour to perform his part as an individual; and it is much, that an individual may perform, be he ever ſo inſignificant, if he do all the good, that the ſituation, in which he is placed, brings within his power.--But to return to our 7th and laſt ſpecies of calyx:---Volve is the term uſed by Linneus for the calyx of funguſes, which, when we come to that tribe of plants, may be more fully explained. We will examine the different kinds of calyxes given in this plate, and the calyxes of ſuch flowers as are now in bloom,

bloom, and then proceed to the other parts of fructification. The Corol is that part of a flower, which moſt attracts our notice, conſiſting generally of beautifully coloured leaves. Linneus ſays, that it is formed from the inner rind of the plant, as the calyx is from the outer; it's leaves are called Petals, which term pray remember, as it is neceſſary to prevent confuſion betwixt the green leaves of a plant, and the coloured ones of the flower. By the number, diviſion, and ſhape of the Petals, the different kinds of Corols are diſtinguiſhed; a Corol is called one-petalled, when it conſiſts only of one piece; two, three, or more petalled, according to the number of pieces of which it is compoſed. What would you call this Polyanthos flower?

Harr. I ſhould call it five-petalled.

Charles. So ſhould I, if I only looked at the top; but I do not know what to call the part, which the five round leaves grow from.

Hortenſ. The polyanthos is a one-petalled flower, though on the firſt view, from it's diviſions round the margin, it appears to conſiſt of five petals. The beſt way of knowing, whether a flower conſiſt of one or more petals, is to try to take them off all together; the

the one-petalled flowers, be their diviſions ever ſo deep, have their petals united together at the baſe, forming a tube, ſometimes very ſhort, but long in polyanthos, as you may ſee by taking off the petal. In flowers of many petals they are fixed by the claw to different parts of the fructification, which circumſtance is frequently of uſe in diſtinguiſhing one flower from another. Linneus has availed himſelf of it in his formation of the génera, or families of plants. The various ſhapes of the corol are alſo of great uſe in this particular, and therefore ſhould be accurately underſtood; a more clear idea may be given by plates than by deſcription. I will enumerate the various kinds, and then we will look them over in our plates, and compare them with flowers. There are ſeven different forms of the corol: bell-form, of which there are great varieties; funnel-form; ſalver-form; wheel-form; croſs-form; gaping and grinning corols, which may be conſidered as different kinds of the ſame form; and papilionaceous, or butterfly-form, which belongs to the pea-bloom, or lupine tribe of flowers. There is an eighth form, which does not belong to any of theſe that I have mentioned, and is properly called an

irregular

irregular flower; of this kind are the monkſhood (aconítum napéllus), violet (víola), larkſpur (delphínium), orchis, and fraxinella (dictámnus). Campánula is an inſtance of the bell-form; of the funnel-form, henbane (hyoſcy'amus) and oleander (nérium); of the ſalver-form, periwinkle (vínca); of the wheel-form, mullein (verbáſcum), and pimpernel (anagállis); the croſs-form may be ſeen in wall-flower (cheiránthus), and in candy-tuft (ibéris), and conſiſts of four petals nearly equal, and ſpread at the top upon claws, the length of the calyx, in form of a croſs. The butterfly form is ſeen in peas; the gaping and grinning in white archangel (lámium), and ſnap dragon (antirrhínum).

Henry. I often make ſnap-dragons grin at Juliette; they look very like a mouth, when I ſqueeze them; I never thought peas like butterflies.

Hortenſ. The reſemblance is not very exact, though more ſo on examination than at the firſt view. There is another part of the fructification, which Linneus conſiders as belonging to the corol, and to which he firſt gave a name; this is the Nectary, ſo he has called that part wherein the honey is found, from the

the fancied reſemblance to the fabled liquor of the gods, concerning which you remember that we were reading yeſterday. The Nectary frequently makes a part of the corol, but as frequently is diſtinct from it: in honeyſuckle (lonicéra) you have often taſted the ſweet drops at the bottom of it's tube, and alſo in cowſlips (prímula). I could amuſe you on this ſubject, but at preſent it is ſufficient to inform you, that there is ſuch a part belonging to moſt if not to all flowers.

Harriet. We will be very diligent in learning the rudiments of the ſcience, that we may the ſooner come to the amuſement of it. I long to diſſect a flower.

Hortenſ. That you may ſoon do, if you are attentive. A moſt eſſential part of fructification is the *ſtamen*; as by it the fine duſt, or powder, is prepared, which makes the ſeeds capable of producing young plants. The Stamen conſiſts of three parts, the Filament, the Anther, and the Duſt. The Filament is the thread on which the Anther grows; the Anther is that part, which you have hitherto often wrongly called the ſeed; it contains the Duſt, and, when ripe, burſts and ſcatters it abroad for the uſe to which nature

nature has deſtined it. You have often ſeen it fly about nettles (urtíca), and the ſweet gale (myríca). Nature has guarded with nice care this precious duſt, as on it's preſervation depends the continuation of the ſpecies. The apparatus, by which in many flowers it is defended from injury, is very curious, and often gives a ſingular appearance to the corol. In wet years it ſometimes happens, that the exceſs of moiſture cauſes the anthers to burſt, before their contents are ripe, and thus we loſe our cherries and apples. It has been ſuppoſed, that the anthers were preſerved from harm in rainy ſeaſons by a fine waxy ſubſtance encloſing their contents. This idea was believed by Reaumur to be erroneous ſome years ago, and the experiments of the late Mr. John Hunter confirm his opinion. Mr. Hunter affirms, that the ſubſtance gathered by bees from the anthers of flowers is not wax, as is generally ſuppoſed, but that it is collected by them as food for the bee-maggots, and is what you call the bee-bread. A part no leſs important is the Piſtil, as it contains the ſeed, which is to be fertilized by this Duſt. The Piſtil alſo conſiſts of three parts, the Germ, the Style, and the Stigma.

Germ

Germ is the term for that part, which contains the ſeeds, before they are mature; when mature, the ſame part takes the name of Pericarp. The Style is that ſmall pillar, which grows from the Germ, the top of which is called the Stigma. This part is of great importance, as it receives the Duſt of the Anthers, and conveys it through the fine veſſels of the Style to the ſeed contained in the Germ. Indeed the Anther and Stigma are by Linneus conſidered as the eſſential parts of a flower, and in the language of botany they conſtitute one; theſe parts being preſent are ſufficient to the production of fruit, without them there can be none: the preſence of the Stigma implies that of the Germ, as the Anther does of the duſt: there is however another part, which the late inveſtigations of a celebrated philoſopher ſeem to make an eſſential one; this is the Nectary; from his reaſoning it appears, that the honey contained in it is intended for the nouriſhment of the Anthers and Stigmas; conſequently whenever theſe are found, it will be found alſo, as I believe it commonly is, though ſome flowers are ſaid to be without it; this, however, may not be the caſe, as the

the part in queſtion had not even a name before the time of Linneus, and the world is yet only conjecturing about its uſe.

Jul. I thought the honey had been for the bees, mamma? Can flowers eat?

Hortenſ. That enquiry does not belong to the preſent part of our ſtudy; but I will ſo far tell you, that I mean to make my favourite flowers not only beautiful objects of ſight, but agreeable companions: before I have done with them they ſhall eat, drink, ſleep, and have a will of their own.

Henry. O, dear mamma; then you muſt have a fairy wand?

Hortenſ. I ſhall uſe no magic art; and, I aſſure you, I am not in jeſt. I do not tell you that I ſhall make them of the firſt order of animals, but, I think, I can convince you that thay deſerve a place among the animated creation.

Charles. This Mr. Wilſon has told me, and I thought ſo too, when he talked to me about it; but having only been told the fact, and not having ſtudied the ſubject, I had forgot it again.

Harr. O Charles, I wiſh we had been always as attentive as Henry and Juliette, we

ſhould have known all this now, and made experiments like mamma.

Hortenſ. The paſt cannot be recalled; be induſtrious henceforward, and make up the time that you have loſt. We will finiſh the parts of fructification, and then you will have done enough for the firſt lecture. There are eight different kinds of Pericarp, or Seed-veſſel; 1ſt. Capſule, 2d. Silique, 3d. Legume, 4th. Follicle, 5th. Drupe, 6th. Pome, 7th. Berry, 8th. Strobile. Capſule is a little cheſt or caſket, a dry hollow ſeed veſſel, when ripe, which ſplits in different ways, and diſcharges its contents, ſometimes with great force, ſo as to diſperſe them to a conſiderable diſtance; you have all amuſed yourſelves with the ſeed-veſſel of Touch-me-not, which is a Capſule. From the violent manner in which this plant diſperſes its ſeeds, Linneus has named the genus or family, Impátiens, the ſeed-veſſel of víola, violet, and panſie is a Capſule; before this ſpecies of ſeed-veſſel is ripe, it is frequently fleſhy and ſucculent, like a berry, which pulpy ſubſtance probably is intended for the nouriſhment of the young ſeeds. Silique is a Pericarp of two valves, but as ſome are long and larger, others round

or broad, and leſs, Linneus has diſtinguiſhed them by their form into Silicle and Silique, and has founded on this circumſtance the orders of one of his claſſes: the Silicle is roundiſh; the ſeed veſſels of allyſon of crete (allyſum ſaxátile) is an inſtance; and candy-tuft (ibéris), the common wall-flower (cheiránthus), and cabbage (bráſſica), are examples of the Silique. The Legume is diſtinguiſhed from the Silicle and Silique by the manner in which the ſeeds are fixed to its edges; in the Silicle and Silique the Seeds are fixed alternately on each ſide of their edges, in Legume they are fixed on one ſide only; the Silique ſeed-veſſels belong to the croſs-form flowers, the Legume to the papilionaceous; it is this part that we eat of french-beans, and of ſome kind of peas. Follicle is a bag, which opens on one ſide, and has its ſeeds fixed to a receptacle or thread within this bag, inſtead of being faſtened to the edges of the bag itſelf; when the ſeeds are ripe, it opens lengthways on one ſide; the bladder ſenna (colútea) has a Follicle for its ſeed-veſſel. Drupe is a Pericarp, or ſeed-veſſel, that is generally ſucculent or pulpy, having no valve or external opening, and generally contains within its

ſubſtance a ſtone or nut, within which lies a kernel, that is, a ſeed: there are exceptions to this definition, but it would confuſe you to name them at this time; all the ſtone fruits are properly Drupes. Pome belongs to thoſe fruits, which contain within their fleſhy pulp the other kind of ſeed-veſſel called Capſule; the apple (pyrus) is an inſtance of the Pome: the core of the apple is the Capſule; the pippins contained in it are the ſeeds; this kind of Pericarp, or ſeed-veſſel, has no valve or outward opening. What you call the bloſſom of the apple was the calyx. Berry is a pulpy ſubſtance containing ſeeds, diſpoſed promiſcuouſly through the pulp, without other covering, raſberries (rúbus), Strawberries (fragária), gooſeberries (ríbes), anſwer well to this definition: in many gé-nera, or families, the berry and the drupe ſeem to have been imperfectly defined; as we proceed, I ſhall point out to you the defects of Linneus in his moſt ingenious ſyſtem, but they are ſo few as ſcarcely to caſt a ſhade upon the light which this illuſtrious naturaliſt has introduced into the ſcience of botany; indeed ſome of his definitions, which have been treated as obſcure, have been proved,

proved by late experiments to be moſt exact. I tell you this to warn you from being too haſtily led to think ſlightly of the merits of this great man, by a book* which I ſhall put into your hands, and which will give you much information; but, at the ſame time, you will find the ſmall failings of Linneus pointed out in it with an ungenerous acrimony. The Strobile is defined to be formed of an Ament with hardened ſcales; this, when you underſtand the ſubject, you will find to be a juſt definition, at preſent it conveys no preciſe idea to you; this kind of ſeed-veſſel is found in the fir tribe.

Charles. Then, for the future, we muſt call the cones, the fir-apples, Strobiles?

Hortenſ. That is their ſcientific name; the Strobiles of the larch (pínus larix) are beautiful.

Henry. Juliette and I always admire them much; they are crimſon and green, like what you told us of the Aments of the birch.

Hortenſ. Henry has remembered to uſe the proper term, of which I perceive he is not a little proud. The Seed is defined by Linneus

* Milne's Botanical Dictionary, 7s. bound.

to be the rudiment of a new plant: a Seed conſiſts of 1ſt. the part which is to be the new plant, and, 2d. of nouriſhment for that new plant till it has attained ſufficient ſtrength to provide for itſelf: the young plant conſiſts of what are termed the *Plume* and the Radicle; the Plume riſes into the air, and conſtitutes the trunk and branches; the Radicle penetrates into the earth, and forms the roots. The Cotylédons, which are the mealy ſubſtance of the ſeeds, are converted into a ſweet juice by the growth of the plant, and are abſorbed by it; theſe ſweet ſtores of nouriſhment laſt long enough for its ſuſtenance, till by having thrown out roots it collects its own food; as lambs and the young of the higher order of animals ſuck milk, till they are able to ſeek their own nouriſhment. The Plume, the Radicle, and the Cotylédons of a bean (vícia faba) we will examine. By ſoaking a bean in water they may be well ſeen. I will ſhew you a drawing of a cucumber (cúcumis) ſeed. If you ſplit an almond (amy'gdalus), you may ſee, lying within the kernel, which makes the Cotylédons, two beautiful ſmall leaves ſawed round their edges, growing upon a little ſtalk, which is the Radicle, as the

the leaves are the Plume. If the Cotylédons of a bean be cut off, the young plant is ſtarved and dies, or becomes very weak; graſs has its Cotylédons under the ground, which preſerves them from deſtruction: ſo has corn, which however is not ſafe from all enemies; the wood-pigeon digs with her bill till ſhe finds the Cotylédon of the corn, and then eats it, pleaſed, as I conclude, with the ſweet taſte that it has acquired, as the plant or Plume has ſprouted. The care that nature has taken for the preſervation and diſperſion of ſeeds is admirable; in ſome plants they are wrapt up in ſoft down; as for inſtance in cotton plant (goſſy'pium); the part, of which we make our muſlin dreſſes, was originally the ſoft cradle of ſeeds; as the material, of which our ſilks are made, was the cradle of an inſect. Some ſeeds you have ſeen nouriſhed and kept warm by the pulp of our fruits; others are protected by ſoft hairs: in thiſtles (cárduus) they lie in a ſoft ſilk-like ſubſtance, the down of the ſeed of artichoke (cy'nara) is particularly beautiful; others are ſurrounded by what is termed an Aril, which is of a ſubſtance very like parchment.

Harr. I have ſeen it, I think, in fraxinella: pray does not it line the outer huſk, that has ſo ſweet a ſmell?

Hortenſ. It does, and burſts ſuddenly, when the ſeeds are ripe. That little white caſe, out of which the ſeeds of wood-ſorrel (óxalis acetoſella) leap, when you have warmed them by holding them in your hands, is an Aril. You may alſo find it in the ſpindle tree (euónymus), which Juliette calls the red comfit tree.

Charles. This is very entertaining: pray, ma'am, tell us how nature has provided for the diſperſion of the ſeeds?

Hortenſ. By various methods; ſome ſhe has enabled to fly by a ſmall light crown fixed on their tops, others have ſingle feathers, others ſmall feathery tufts: you are all well acquainted with the feathered ſeeds of dandelion (leóntodon), and have proved by blowing on them, how ſmall a degree of air is required for their diſperſion, when ripe; ſome have an appendage like a wing, as the ſeeds of ſycamore (acér); the centaurea has a ſeed furniſhed with a tuft ſo nearly reſembling a camel-hair pencil, that it might be miſtaken for

for one; feather graſs (ſtípa) has a beautiful plume; one of theſe plants makes an elegant appearance, when in a bright day with a gentle wind a number of theſe plumes are ſeen together, waving in the air, and ſhining like ſilver; but the moſt curious of the flying ſeeds is that of the tillándſia; this plant grows on trees, like the miſletoe (viſcum), and never on the ground; the ſeeds are furniſhed with many long threads on their crowns, which, as they are driven forwards by the winds, wrap round the arms of trees, and thus hold them till they vegetate: this is very ſimilar to the migration of ſpiders on the goſſamer, who are ſaid to attach themſelves to the end of a long thread, and riſe thus to the tops of trees or buildings, as the accidental breezes carry them. Theſe flying ſeeds are carried to a very conſiderable diſtance from their parent plant; others have hooks, by which they attach themſelves to the hair or feathers of animals, or by a glutinous ſubſtance, in which the ſeed is lodged, as miſletoe. The ſeeds of aquatic plants, and thoſe which grow on the banks of rivers, are carried many miles by the currents, into which they fall; ſome of the American fruits,

among

among which is the cocoa-nut (cócos), are annually thrown on the coaſts of Norway. Charles ſhall read to us ſome beautiful lines out of the Botanic Garden, to which this wonderful fact has given riſe.

Harr. We ſhall all like that vaſtly; you have treated us with ſome things out of that poem before, ma'am.

Hortenſ. I ſhall have frequent occaſion to recur to it, as we proceed in our botanical ſtudies: I do not know a book, which contains more variety of knowledge on the ſubject, or any one where that knowledge is ſo clearly and agreeably given; I have learnt much from it. Birds are the means of diſſeminating ſome kind of ſeeds, either by dropping them as they carry them from place to place, or by parting with them whole, after they have ſwallowed them. In this way ſeeds are frequently dropped in the hollows of trees, where, if they meet with a ſufficient quantity of ſoil and moiſture, they vegetate, and make an extraordinary appearance: ſuch is the holly (ilex) growing in the birch tree, which you ſee every day, and which in winter is peculiarly beautiful from its deep green foliage and ſcarlet berries, being intermingled

mingled with the white ſhining branches, and elegant brown pendant twigs of the birch; ſuch is the mountain aſh (ſorbus) in the apple tree.

Charles. Do the roots of the mountain aſh penetrate into the apple tree—the place they grow in ſeems too high above the ground to admit of their drawing any nouriſhment from the earth?

Hortenſ. I do not exactly know in what manner ſuch trees receive their nouriſhment; they become, I imagine, paraſite plants; that is, derive their food from the juices of the tree on which they grow, or perhaps live chiefly on the air, as thoſe trees muſt neceſſarily do, which grow out of rocks or walls, where there is not earth ſufficient for their ſuſtenance; laſtly, ſeeds are diſperſed by an elaſtic force in the ſeed-veſſel, or in ſome part belonging to the ſeed. Stipa (feather graſs), as its ſeeds arrive at maturity, diſlodges them, by twiſting the baſe of the long feather by which they are crowned, till it flies from the receptacle, and carries the ſeed to a conſiderable diſtance from the plant: thus are the ſeeds of geranium and barley diſperſed by the

the twiſting of the awn which crowns them; this is ſaid to be effected by moiſt weather, by means of which they are lodged in the earth at the time, when it is beſt fitted to receive them. The Receptacle is the laſt part of fructification, that we have to conſider; it is that part, by which all the other parts of fructification are connected, and by which they are ſupported: it is called a proper receptacle when it ſupports the parts of only one flower, as in prímula, anemóne, and tulip; a common receptacle, when it ſupports ſeveral florets. This laſt kind of receptacle belongs to what are called the compound flowers, which you will underſtand hereafter; an inſtance of a *common* receptacle you may ſee in ſcabious (ſcabióſa), dandelion (leóntodon), and daiſie (béllis); all thoſe parts, which you ſuppoſe to be the leaves of one flower, are flowers themſelves, and are arranged under a particular claſs. The various circumſtances belonging to this kind of receptacle are made uſe of by Linneus to diſcriminate the génera, or families of this claſs. Now we will look over our plates, and rehearſe what we have learnt.

At

At our next lecture I hope that you will each of you bring with you a flower, which will ſhew ſome one of the numerous parts, and the different ſpecies of thoſe parts, which I have endeavoured to explain to you; or, for your firſt eſſay, an inſtance of each kind of calyx and corol will be ſufficient.

DIALOGUE THE SECOND.

A Flower diſſected: the different kinds of Fulcra and Inflorescence explained.

Hortenſia. I perceive you have all been very diligent: lay down your flowers, and I will look them over.

Harr. We have endeavoured to find the different kinds of calyxes and corols, but I am afraid we may not have been quite right.

Hortenſ. If I find you are for the moſt part ſo, I ſhall think you have done very well: this verónica and crowfoot certainly have the Perianth kind of calyx; this earth-nut (búnium) of the Involucre, and at the ſame time the ſingle florets ſhew the Perianth, which may have eſcaped your notice from being ſo minute. This walnut bloom (júglans) ſhews the Ament; this narciſſus the Spathe. The other three kinds of calyx, the Glume, the Calyptre, and the Volve, as they belong to peculiar and difficult claſſes of plants, we will not at preſent think about. Your flowers are all equally right: pray what ſhare had Henry and Juliette in making the collection?

Harr.

Harr. A great deal indeed, mamma; the hare-bell and verónica I had laid aſide for many-petalled flowers; but Henry remembered, what you had ſaid about trying them, and pulled off the Corols, and found they were only one-petalled; and Juliette ſaid at firſt, that the hare-bell had a bell-form corol, and the verónica a wheel.

Hortenſ. The wheel-form of the verónica is leſs decided, from the inequality in the breadth of its petals. You perceive, that the loweſt petal is narrower than the other three; this circumſtance is a mark, which diſtinguiſhes that family of plants. The curling diviſions of the corol of the hare-bell diſguiſe its form alſo; but in neither of theſe génera is the form of their corols the eſſential character; that circumſtance therefore is of leſs conſequence.

Charles. Pray, ma'am, in this many-petalled flower of the crow-foot, what muſt I call this little hollow notch at the bottom of each petal? There is ſomething ſhines in it like honey, is it the nectary?

Hortenſ. I rather ſuppoſe the ſhining appearance is cauſed by the rich texture of the petal; that notch is the nectary, and is the eſſential

eſſential character of the ranúnculus family, the proper name of your crow-foot being ranúnculus; this mark you will find alſo in the double flowers. The minute circumſtances, which Linneus has availed himſelf of for the diſcrimination of one plant from another, fills us with admiration; till his time there was much confuſion in the ranúnculus tribe; his penetrating eye marked this ſmall appendage to the petal; he found it to exiſt uniformly in the individuals of the genus; and we are now no longer at a loſs to diſtinguiſh a ranúnculus from other families, which in their outward appearance much reſemble it.

Charles. It would be very agreeable, if all flowers were ſo decidedly marked.

Hortenſ. You will find them more eaſily to be diſtinguiſhed from one another than you imagine, though rarely by ſo obvious a character as this of the ranúnculus; yet when you underſtand how to ſtudy the ſyſtem of vegetables, you will find that very minute circumſtances, and ſuch as in the common obſervation of a flower we might overlook, have been made uſe of to mark not only one family, but every individual of that family from each other.

Charles.

Charles. This is like the ſhells of which I was ſo ſure I could find two alike, though you, ma'am, told me I could not.

Hortenſ. The leſs we know, the more apt we are to be poſitive.—But to return to our general ſubject:—This ladyſmock (cardámine) is a right ſpecimen of a croſs-form flower; this lung-wort (pulmonária) of the funnel-form; this thyme (thy'mus) of the grinning; this broom (ſpártium) of the butterfly. As a reward for your great attention, we will diſſect a flower; the parts of crown-imperial are ſo large, that it is well ſuited to our purpoſe. Be ſo good to gather one, Charles, alſo bring a poppy and a tulip at the ſame time.

Charles. I have brought the flowers; but I think they have not any of them a calyx.

Hortenſ. The calyx of the poppy (papáver) falls off immediately when the flower expands; the crown-imperial (fritillária imperiális), and the tulip (tulípa) have none. You may recollect, I told you that there are only two parts of fructification neceſſary to conſtitute a flower in botanical language, though perhaps there properly may be a third, the Nectary; the calyx is the part wanting in

theſe two flowers; but we muſt not, when we find only one of theſe covers, and that coloured, always infer that it is the Corol, becauſe it is not green.

Harr. How then are we to diſtinguiſh the Calyx from the Corol?

Hortenſ. In moſt caſes the Corol may be known by the gayneſs of its colour, or by its not incloſing the ſeeds; but there are too many exceptions to theſe rules for them to be relied on. The petals in paſſion flower (Paſſiflóra) are not coloured; the corol in Selágo incloſes the ſeeds; they may however be diſtinguiſhed by the following rule: the ſtamens and petals are found to be ranged alternately in the complete flowers; that is, ſuch as have both Calyx and Corol of the fourth and fifth claſſes of Linneus's ſyſtem; hence this is concluded to be their moſt natural ſituation, while the ſtamens are placed oppoſite to the diviſions of the Calyx; Linneus ſeems to conſider this as a conſtant mark; yet he terms the ſingle cover of many plants of the ſixth claſs a Corol, in contradiction to it. Here is only one cover preſent in this crown-imperial; examine it, and determine whether it be a Calyx or a Corol.

Harr.

Harr. The ſtamens and petals are not placed oppoſite, ſo I ſhould ſay it was a Corol.

Hortenſ. According to the rule, you would be right; however, as I have told you that a cloſe obſervance of this rule would lead you into error in examining many of the beautiful flowers of the ſixth claſs, I recommend to you to follow Linneus in the term that he has given to the only cover that you will find, and call it a Corol, till theſe ſmall defects of his ſyſtem are removed by the attention of thoſe, who, knowing its great merit, are more deſirous to render it perfect than to expoſe and cavil at the few errors they can find in it; our crown-imperial has all its parts, except the Calyx; the Corol is ſix-petalled, and belled; obſerve with what grace theſe beautiful bell-flowers are hung round this rich green ſtem, and the elegant appearance of this tuft of ſhining green leaves riſing in the middle of them; the ſmall cavity at the bottom of each petal, filled with honey, you have all often admired.

Jul. That we have, mamma; Henry and I very often ſtop to look at thoſe pretty drops; they are the Nectaries, I ſuppoſe; we have wondered the honey did not fall out.

Hortenſ. The quantity is ſo nicely fitted to the part which contains it, as to be always full, and apparently ready to overflow, yet never to exceed its proper limits. If we were to take the natural honey out, and replace it by honey and water, we ſhould find it difficult to make it ſtay in; nor will it do ſo if the cavities are filled by art as full as they are by nature, ſo poor and clumſy are our imitations of her in even the moſt ſimple of her works. The Stamens and Piſtils are very conſpicuous in this flower; the Duſt from the Anthers is beautiful when ſeen through a microſcope: we will look at it. You will be ſurprized to obſerve the perfect form of its ſeparate particles; the Stigma and Style we will alſo examine, though with the naked eye we may ſee that moiſture at the top of the ſtigma of this large flower, which fits it to receive the Duſt of the Anther, and from thence to convey its eſſence through the Style to the Germ; when this Germ becomes a Pericarp, that is, when it becomes mature, it is a Capſule filled with large flat ſeeds. Now we have taken off theſe five parts ſeparately; tell me, Henry, what name belongs to the ſixth part which remains?

Henry.

Henry. I think, the Receptacle.

Hortenſ. You are right.---Here are only ſix parts of fructification to be found in this flower; do you, Juliette, recollect the name of the one it is deficient in?

Jul. The Calyx, Ma'am, is it not?

Hortenſ. It is, my dear; I am much pleaſed by the attention of you all; and am particularly ſo, that you and Henry do not find it difficult to remember the ſcientific names. There is another part which may be miſtaken in ſome flowers for their Calyx; this is what is termed the Bracts, or Floral-leaves; they are ſituated on the petiole, or flower-ſtalk, and often ſo near the fructification as to be confounded with the Calyx. Examples of the Bract may be ſeen in tilia (lime-tree), monárda, paſſiflora, paſſion-tree; the Bracts may be diſtinguiſhed from the Calyx by their longer duration; they differ in ſize, ſhape and colour from the other leaves of the plant, but commonly continue as long as they do, whereas the Calyx always withers when the fruit is ripe, if not before. There is a ſpecies of Bract which conſiſts of a tuft of leaves, which terminates the flower-ſtem; we have juſt now admired this tuft in the

crown-imperial. There is a ſpecies of ſage (ſálvia) whoſe Bracts are beautifully coloured; ſometimes they are red, and ſometimes of a deep blue. Linneus has made great uſe of theſe ſingularities in determining the ſpecies of plants; therefore you ſhould be well acquainted with them. The Bract is ranked amongſt the Fulcra, or ſupports of plants, of which I ſhall treat preſently. This poppy and tulip ſhew you the ſtigma attached to the germ, without the intervention of the ſtyle; the germ of poppy with its ſtigma is very beautiful; the ſtigma ſhuts up the germ, like the lid of a box; when the germ is mature, it is a capſule, and opens at the top in ſeveral places to let out the ſeeds, which are very numerous. From one head of white poppy, 800 ſeeds are ſaid to have been produced in one ſummer. This has been aſcertained by counting the number of ſeeds, which would weigh a grain or two, and then by weighing the whole. Your trouble will be well repaid, if you examine ſeeds of all kinds through the microſcope; they have much beauty, which from their minuteneſs eſcapes common obſervation.

Harr. Violet ſeeds I have often admired.

Hortenſ. They are worthy of admiration; the variety, that may be found in ſeeds, is very great, both in ſize, ſhape, and ſurface, alſo in the veſſels which contain, and the ſubſtance which encloſes them, before they are ripe. If you conſider the difference in the ſize of the cocoa-nut ſeed, and that of the poppy, you may imagine there muſt be many different ſizes between theſe two extremes. The appendage, which nature has given to ſeeds for their diſſemination, alſo adds much to the beauty of many of them. The ſeed of the common chick-weed is worth looking at through a microſcope, the ſurface of it being like the muſſel-ſhell. In my cabinet I can ſhew you the pictures of various ſeeds elegantly given in Mr. Curtis's London Flora.

Harr. That is the book in which you ſhewed us the graſſes?

Hortenſ. Their mode of flowering is well explained there, and their very minute parts of fructification drawn with great accuracy. It now remains for me to inſtruct you in what is termed the Fulcra and Infloreſcence of plants, and then we may begin with the claſſes.

Harr. That we ſhall like.

Hortenſ. I am afraid that you are rather more apt to expect pleaſure from your ſtudies than to find it; the ſtudy of either a ſcience or a language can only be agreeable, as it is a mean to attain an end; when you enter upon the practice of what you have learnt, then will the amuſement begin.

Charles. I have a great deal more pleaſure in looking at flowers, now I know their ſeparate parts, and have ſome idea of the uſe of thoſe parts, than I had before, when I was wholly ignorant of them.

Hortenſ. I dare ſay you have; and the more you apply the knowledge you have gained, the readier you will find yourſelf in learning, what remains for you to be inſtructed in. Linneus has named thoſe parts of plants, whoſe chief uſe is to ſtrengthen and ſupport them, Fulcra, or Props; *ſupports* is the term given them in the tranſlation of the ſyſtem of vegetables: they are defined to be, aſſiſtances for the more commodious ſupport of the plant. There are *ſeven* kinds of Fulcra, or Supports: Petiole, Peduncle, Stipule, Tendril, Pubeſcence, Arms, Bract. Petiole is the foot-ſtalk of a leaf, which it ſupports without any flower. Peduncle is the

foot-

foot-ſtalk of the flower. Petiole is defined to be a prop ſupporting the leaf. Peduncle, a prop ſupporting the fructification. Stipule is a ſcale, or ſmall leaf ſtationed on each ſide of the baſe of the Petioles, or Peduncles, when they firſt begin to appear, as may be ſeen in the Papilionaceous, or butterfly ſhaped flowers: I dare ſay you have obſerved the Stipules of the tulip-tree (liriodéndron).

Henry. Juliette and I have often obſerved them, and amuſed ourſelves with pulling them off, and examining the very little leaves which are ſo pretty within them; I did not know thoſe two blueiſh ſcales had any particular name; I will always call them Stipules now.

Hortenſ. Pray do. The Stipules of all plants ſhould be attended to, as they frequently ſerve to diſtinguiſh one ſpecies from another; I admire as much as you do the ſmall leaves of the tulip tree encloſed by their Stipules; it is pleaſing to contemplate the care which nature has taken to preſerve theſe infant leaves from all outward injury, and how perfectly they are formed in every part, though you may find them ſo minute as to require a microſcope to examine them accurately; theſe

two

two Scales, or Stipules, protect and cheriſh them till they acquire ſufficient ſtrength to ſupport themſelves. The Stipules of the plane tree (plátanus) add much to the beauty of the tree in ſpring, being formed like little ruffs which ſurround the branches. In peach (amy'gdalus) and bird-cherry (prúnus) the Stipules reſemble two very ſmall narrow leaves, and are ſeated at the baſe of the Petiole of the common leaves. The Tendril you are all acquainted with; thoſe plants are generally furniſhed with this kind of Stipule, which are not ſtrong enough to ſupport themſelves. Vines (yítis) twiſt themſelves round other trees by their claſpers or tendrils, and thus raiſe themſelves from the ground. Long poles are placed in our hop-yards for the ſupport of the hop plants (húmulus), which make a very elegant appearance in their moſt luxuriant ſeaſon; their natural place of growth is in hedges, where they readily find ſupporters; all theſe climbing plants are in ſome degree injurious to the tree of which they take hold for ſupport, as they deprive it of that ſhare of light and air, to which it has a natural right. There are however ſome climbing plants, which ſeem in-

intended by nature to receive their nouriſh-ment from other plants, as dodder, cuſcúta. The ſeed of this plant ſplits without Cotylé-dons, ſo that the young plant, having no ſtore of nouriſhment laid up for it by nature, ſeems neceſſitated inſtantly to find a foſter mother, or to periſh; when the ſeed ſplits it protrudes a ſpiral body, which, without making any attempt to root itſelf in the earth, aſcends the vegetables in its neigh-bourhood, twiſting round them, and abſorb-ing its nouriſhment by veſſels apparently in-ſerted into its ſupporters: this muſt injure the plants it lives upon materially; and I am ſorry to find an inſtance of ſo much ingra-titude in the vegetable kingdom, for the ſe-quel of the hiſtory is, that after it has been afforded ſupport and nouriſhment by a ſtran-ger plant, it overpowers and ſmothers its protector: in this reſembling thoſe vicious human creatures who, being too idle to work for their own ſupport, bring their parents to poverty and death, by the efforts their tenderneſs induces them to make for their ſubſiſtance.

Jul. Oh, mamma, I hope there are not many ſuch people!

Hortenſ.

Hortenſ. We will hope not, my dear: I am happy to ſay there are but few inſtances of ſuch plants as cuſcúta in the vegetable kingdom. In moſt ſituations the injury is ſmall, which the ſupporters of the climbing plants ſuſtain from the aſſiſtance they afford, as generally the climbers have roots which ſtrike into the earth, and from thence draw nouriſhment.

Henry. I think, mamma, you told us, that the hop buds, we eat in ſpring, are the tops of the hop plant?

Hortenſ. They are. Climbing plants are of ſuch quick growth, that there tops are always tender, and, when rendered mild by boiling, are agreeable food. The tops of white bryony (bryónia) are ſaid to be ſweet and pleaſant to the taſte, but I have never eaten of them. There is one plant of the paraſite kind, which appears to be ſo from choice, as it firſt vegetates in the earth, and is ſometimes found growing in it; nor has it any want of ſupport from its neighbours, being a ſtiff ſhort ſtemmed plant; this is the orobánche major, it grows upon the roots of other plants, chiefly upon the butterfly-flowered tribe; it has an extremely ſmall ſeed,

which

which makes it difficult to ſhew its vegetation by experiment, more particularly as it requires a peculiar ſoil and ſituation for its culture. Mr. Curtis, in his London Flora, gives a plate of it, and ſuppoſes, that when the ſeed has firſt vegetated in the earth, that the Radicle ſhoots downwards, till it finds a proper root to attach itſelf to, that it then quits its parent earth, and becomes paraſitical.

Charles. I dare ſay this is the plant I once ſaw when I was with the gardener digging up broom. Pray, ma'am, does it not look like a plant dried in ſand? and is it not of a purpliſh colour? The gardener ſhewed it to me, and ſaid, look how cloſe it ſticks to the roots; but I never thought it grew upon them.

Hortenſ. No doubt it was the orobánche, as it is generally in its paraſitical ſtate, found upon broom hills; though when it contents itſelf with the earth for its nouriſhment, it grows in corn fields, and on hedge banks. I wiſh you had brought me a plant of it, but you were careleſs at that time about ſuch curioſities. We will now conſider the fifth kind of Fulcra, *pubeſcence*, which however may more properly be called a defence than a ſupport.

ſupport. This term is applied to every kind of hairyneſs, which exiſts on plants. If we examine the young parts of plants by a microſcope, particularly the young ſtalks or ſtems, we ſhall find almoſt all of them covered with hairs: this clothing in their tender ſtate ſeems intended to preſerve them from ſevere winds, and from the extremes of heat and cold, which purpoſe it is well adapted to anſwer. Arms is the general term for thoſe points, which prevent animals from injuring the plants; theſe arms conſiſt of Prickles, Thorns, Forks, and Stings. The ſhrubs and trees which have Prickles and Thorns for their defence, are grateful food to animals, as gorſe (úlex) and gooſeberry (ríbes), and would be quickly devoured, if not thus armed. The large hollies in Needwood Foreſt are armed with thorny leaves about eight feet high, and have ſmooth leaves above; which is a curious circumſtance, as it would ſeem to imply a conſciouſneſs in the trees, that when their branches were out of reach of the deer, they had no occaſion for arms; but though they may thus preſerve their lower branches from the attacks of the deer, they cannot defend themſelves from the de-

depredations of the keepers, who lop their upper boughs in winter, and ſtrew them on the ground, and thus furniſh their herds with a grateful food, when herbage is ſcarce; the deer peel off the bark from theſe branches with great dexterity; and this with the ſmooth leaves forms a great part of their ſuſtenance in ſevere winters. Stings, as in nettles (urtíca), are the pipes of a ſmall bag furniſhed with a venomous fluid; when the ſting, or point, has made the wound in your finger, which has touched the plant, this fluid paſſes into it, and cauſes the pain I have heard you complain of, when you have accidently taken hold of a nettle.

Jul. Is it true, mamma, that rubbing my hand with dock leaves will cure the pain; I never was the better for it?

Hortenſ. You may then anſwer the queſtion yourſelf. I imagine the amuſement you find in ſeeking the dock leaves, and repeating the lines of—In dock, out nettle—rather ſerves to divert your mind from the evil than to cure it. There are many curious contrivances for the defence of plants, which may be conſidered as arms. On the leaves of Venus's fly trap (dionæa muſcípula) there is a won-

a wonderful contrivance to prevent the depredations of inſects; the leaves are armed with long teeth, and lie ſpread upon the ground round the flower-ſtem, and are ſo irritable, that, when an inſect creeps upon them, they fold up, and pierce or cruſh it to death. We have a plant of our own country, which in its curious mechaniſm greatly reſembles the ſo much celebrated flytrap; this is the ſun-dew (dróſera): its round flat leaves are thickly beſet with hairs, both on their upper ſurface and on the margin; each of theſe hairs is crowned with a little purple globule, which in the ſunſhine exudes a pellucid drop of mucilage, and gives the whole plant a beautiful appearance. Theſe hairs with their viſcous juice entangle the flies, which attempt to plunder the leaves, ſo completely, that, when once encloſed by them, it is not poſſible they ſhould eſcape. It is alſo ſuppoſed, that the leaves of the dróſera poſſeſs a power of folding themſelves upon the inſect, that they would deſtroy, in a manner ſimilar to thoſe of the flytrap; but theſe reſearches do not belong to the preſent part of our ſubject; I will, however, ſhew you a plate of the ſun dew, and when we walk out we will endeavour

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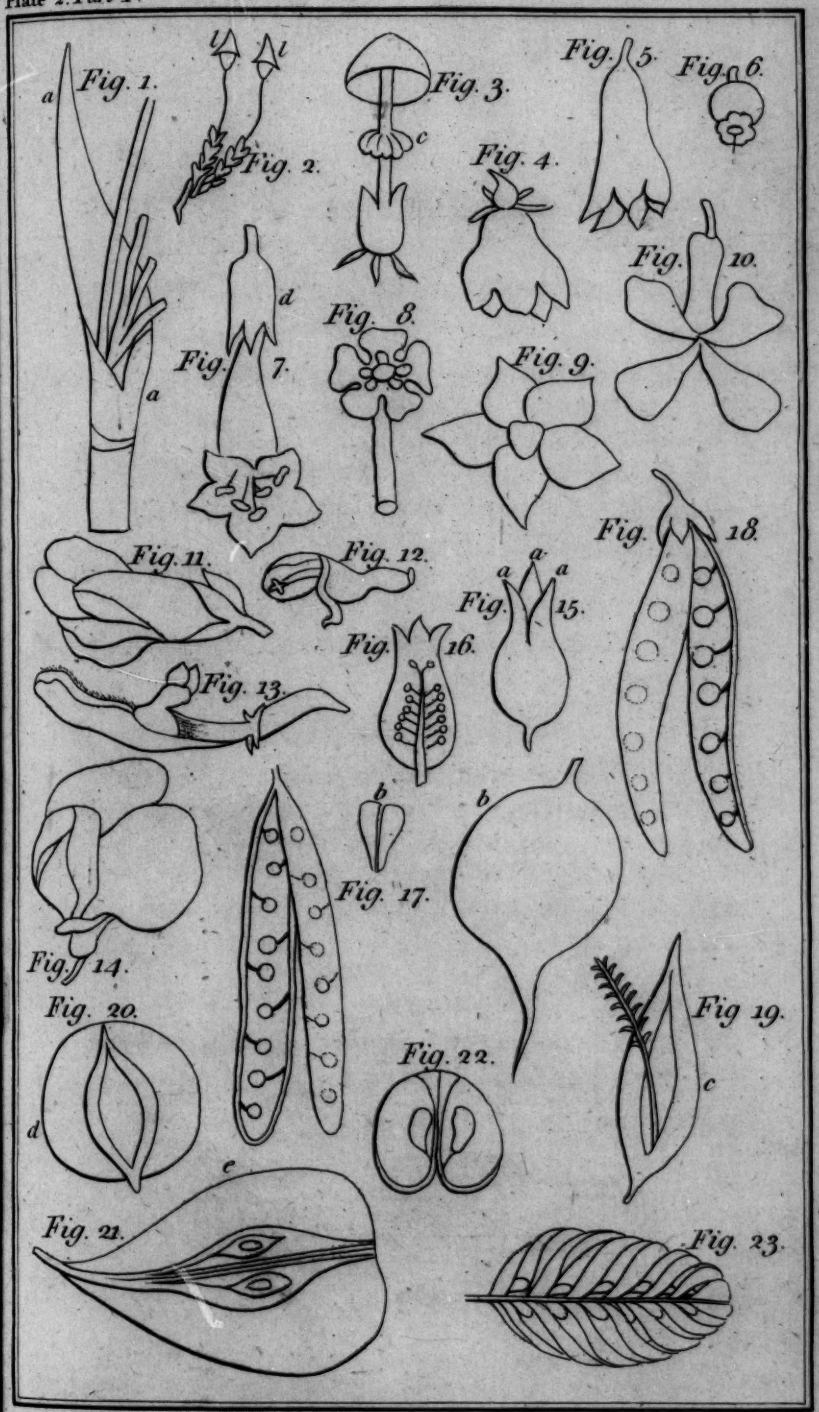
EXPLANATION OF PLATE II. PART I.

OF THE DIFFERENT SHAPED COROLS AND KINDS OF SEED VESSELS.

Fig. 1. A Spathe, *a*, *a*, encloſing the Peduncles of the Flowers.
Fig. 2. The Calyx of Moſs, Calyptre, *b*, *b*.
Fig. 3. The Calyx of Fungus, *c*, called by Linneus a Volve.
Fig. 4, 5, 6. Different kinds of the Bell-form Corol.
Fig. 7. Funnel-form, *d*, the Calyx, a Perianth.
Fig. 8. A regular one-petalled Corol with a long tube, the Corol Salver-form.
Fig. 9. Back view of a Wheel-form Corol, ſhewing the very ſhort tube.
Fig. 10. Croſs-form.
Fig. 11, 12, 13. Gaping and Grinning Corols.
Fig. 14. Papilionaceous, Butterfly-form.
Fig. 15. A Capſule, with three Valves opening at top, *a*, *a*, *a*.
Fig. 16. A Capſule cut open lengthways.
Fig. 17. A Silique and Silicles, *b*, *b*, Silicles.
Fig. 18. A Legume.
Fig. 19. A Follicle, with its receptacle for Seeds, *c*.
Fig. 20. A Drupe, *d*, the Stony Seed.
Fig. 21. A Pome, *e*, the inſide Capſule.
Fig. 22. A Berry (a Grape) cut acroſs, ſhewing the Seeds.
Fig. 23. A Strobile, cut lengthways.



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endeavour to find ſome plants of it; they commonly grow upon marſhes, but I have found them on the wet part of heaths, and on ditch banks; in theſe ſituations they are not difficult to diſcover, as they form a little red patch, which immediately attracts the eye. There is a viſcous juice which ſurrounds the ſtems of ſome plants, and which effectually defends them from the depredations of inſects, as they no ſooner approach them than they are deſtroyed; from this circumſtance a ſpecies of ſiléne has obtained the common name of catch-fly. I could enumerate many more extraordinary arts, which nature has uſed to preſerve the vegetable kingdom from it enemies, particularly from inſects, but at preſent I wiſh only to make you ſo far acquainted with them as to give you an intereſt on the ſubject. We will enter more deeply into this curious part of it, when we begin with the philoſophy of botany.

The Bract, or floral leaf, I have before explained to you. There is another kind of flower-ſtalk, beſide the peduncle, which is termed Scape. The Scape is that kind of flower-ſtem, which raiſes the fructification without

the leaves; it is a naked ſtalk proceeding immediately from the root, and terminated by the flowers. Hyacinth (hyacínthus), lily of the valley (convallária), and áloe are examples of the Scape.

Charles. And the little ſtalks belonging to each flower, I ſuppoſe, muſt be called Peduncles?

Hortenſ. They are Peduncles. Now you are acquainted with the different kinds of flower-ſtalks, you will better underſtand the different modes of Infloreſcence, a term which ſignifies the various manners in which flowers are joined to their Peduncles. There are ſeven different modes of Infloreſcence, diſtinguiſhed by the following terms: Verticil, Head, Spike, Corymbe, Thyrſe, Raceme, Panicle. The Verticil is that kind of Infloreſcence, where many flowers ſurround the ſtem like a ring, or ruff, the individual flowers ſtanding upon very ſhort peduncles, dead-nettle (lámium), and lavender (lavendula), bear their flowers in a Verticil, or Whorl. Head has many flowers collected into a globe on the ſummit of the common ſtalk, ſometimes with, and ſometimes without diſtinct peduncles. Clover and globe amaranthus

(tri-

(trifólium and gomphréna) ſhew this kind of Infloreſcence; it is diſtinguiſhed into various kinds by its ſhape and other circumſtances. Sweet William (diánthus barbatus) has its flowers in that ſpecies of head, which is called a faſcicle, though I think that the mode, in which the flowers of ſweet william are put together, places it more properly under the term corymbe than Head; but I always diſſent from Linneus with great diffidence. The Spike has its flowers placed alternately round a common ſimple peduncle, without any partial ones, which is called being ſeſſile, or ſitting cloſe on the ſtem. Many of the graſſes have their flowers in Spikes; it is called one-ranked, or a ſingle rowed ſpike, when the flowers are all turned one way following each other; a double-rowed ſpike, or two-ranked, when the flowers ſtand pointing two ways, as in darnel (lólium). The Spike, like the Head, is diſtinguiſhed into various kinds by its ſhape, and other varieties. The Corymbe is formed by the partial peduncles produced along the common ſtalk on both ſides, which, though of unequal lengths, riſe to the ſame height, ſo as to form a flat and even ſurface at top. Spi-

ræa opulifolia, candy-tuft (ibéris), alſo is an example of the Corymbe.

Harr. Are not the flowers of earth-nut and parſley Corymbes?

Hortenſ. Their manner of flowering reſembles that of the Corymbe; there is however this diſtinction, the flowers which form the general bunch of parſley (ápium) and earth nut (búnium), which is called an umbel, all grow from the ſame centre; whereas thoſe of the Corymbe grow from different parts of the common flower-ſtalk.

Charles. I am ſurprized to find ſuch a variety of ways in which flowers grow; I envy Linneus having made ſuch diſcoveries: how great muſt be his genius!

Hortenſ. His genius was uncommonly great, but it is his induſtrious application of that genius, which I think moſt to be admired. He was indefatigable in reſearch; hence he diſcovered thoſe innumerable minute and wonderful varieties in every part of a plant, which has enabled him to give the world a ſyſtem, from which by attentive ſtudy we may arrange every plant, that grows, under its proper claſs, order, genus, and ſpecies. We can now converſe in one lan-

guage

guage with botaniſts in every part of the globe. The labours and knowledge of every individual are preſerved, and added to the general ſtock. All this we owe to Linneus; yet I adviſe you not to indulge yourſelf in envy of his great abilities, till you have been as uſeful to the world, as the abilities, which nature has given you, will allow of your being. I always ſet down for idlers thoſe perſons, whom I hear envying diſtinguiſhed characters; they are themſelves commonly weak and indolent.

Charles. I will not deſerve that character, when I am a man.

Hortenſ. I hope, and now believe you will not; but as you are born in that claſs of ſociety, which exempts you, as my eldeſt ſon, from the neceſſity of a profeſſion, it will require more exertion to avoid this character, than you may be aware of; on this account I wiſh particularly to cultivate your taſte for uſeful and elegant ſtudies. If you have philoſophical experiments, which intereſt you at home, you will give no more of your time, than is neceſſary, for the civility of ſocial life to idle and profitleſs company; you will be eager to return to your ſeeds and roots,

or to your laboratory; finding yourself reſpected among men of ſcience, you will ſeek their company.

Charles. I have already found the pleaſure and benefit of ſtudying chemiſtry: as ſoon as I became intereſted by it, I no longer cared for thoſe companions, from whom, ma'am, you have warned me before in vain; and Mr. Wilſon ſaid I was quite changed.

Hortenſ. You are now nearly what I wiſh you to be: a few years paſſed in a courſe of induſtrious habits will, I truſt, fix your character for life. My little Henry muſt exert his induſtry in a profeſſion; he may enter into that of medicine, in which caſe his preſent ſtudies may be of much uſe to him; in any ſituation the ſtudy of a ſcience teaches us to think, which is the foundation of all acquirements, and in my opinion of more value than all the train of accompliſhments commonly taught at ſchools.

Jul. Then, mamma, I am learning two things, botany and thinking.

Hortenſ. One is the conſequence of the other; your works you learn by rote, like a parrot; the acquirement of them may be called the education of the fingers, that of

ſcience, or language, of the mind: they are both becoming the female character; but if I was obliged to omit one in my education of you, which do you think I ſhould lay aſide?

Harr. I know that it would be ſcience and language; becauſe, ma'am, you have always told us, that the firſt point was to make ourſelves uſeful in the ſmall duties of life, which daily occur, and that we may have many opportunities of putting the acquirements of our fingers to uſe, both for ourſelves and others, before we can thoſe of ſcience and language. I ſhould however be very ſorry if I could only work.

Hortenſ. There is no ſituation of life, where a knowledge of work is not requiſite; there are various ſtates, which will not allow of our time being ſpent in purſuits, that cannot be put into daily practice; your ſituation admits of both acquirements. I have however not allowed of your beginning the ſtudy of an amuſing ſcience, while you were idle at that moſt neceſſary one, arithmetic, and careleſs with your needle.

Jul. But, mamma, you have always taught us to think.

Hortenſ. I have endeavoured to do ſo, and have found the advantage of it, in all other things I have had to inſtruct you in. Had you not been accuſtomed to compare one object with another, which is thinking, you would not have underſtood ſo readily, what I endeavoured to explain to you on the ſubject of botany: but we have wandered far from our ſtudy; which of you can tell me where we quitted it?

Henry. You were, ma'am, explaining to us the difference betwixt a Corymbe and Umbel; the peduncles of the Corymbe riſe from the different parts of the common ſtalk of the Corymbe, but all from the ſame part of the Umbel.

Hortenſ. Very well, Henry; you prove that I have not thrown my time away in teaching you the art of thinking. The Thyrſe is the mode of Infloreſcence, we have now to conſider. The flower of lilac (ſyrínga), and of butter-burr (tuſſilágo) are examples of the Thyrſe. Linneus calls it a panicle condenſed into an egged form; the lower peduncles, which are longer, extend horizontally, or croſs-way; the upper, which are ſhorter,

mount

mount vertically, or perpendicular. The raceme has its flowers placed on ſhort partial peduncles, proceeding like little lateral branches from and along the common peduncle; it reſembles a ſpike in having the flowers placed along the common peduncle; but differs from it in having partial peduncles; it alſo differs from the corymbe in the ſhortneſs and equal length of its peduncles, not forming a regular ſurface at top. The vine (vítis) and the currant (ríbes) bear their flowers in Racemes. The Panicle has its flowers diſperſed upon peduncles, variouſly ſubdivided; it is a branching diffuſed ſpike, compoſed of a number of ſmall ſpikes, that are attached along a common peduncle. Oats (avéna) have their flowers in Panicles. We have now gone through the various terms given by Linneus for the manner of flowers being placed on their peduncles, all of which are ranked under the term Infloreſcence. Flowers too are ſometimes found growing on the leaves, as in the rúſcus genus. Dr. Thunberg takes notice of this ſingular kind of infloreſcence, in his account of Japan, having ſeen it in the Oſy'ris Japonica, and calls it a moſt rare circumſtance in nature, from its

rarity,

rarity, I ſuppoſe. Linneus has not thought it neceſſary to diſtinguiſh it by any particular term, though in the rúſcus, where it occurs, he calls it leaf-bearing. The umbel, which I have before explained, the cyme, and the ſpadix he has ranked under the general term receptacle. The cyme and umbel are much alike, both having a number of ſlender peduncles growing from one common centre, which riſe to the ſame height; they differ in the cyme, having its partial peduncles diſperſed without any regular order. Elder (ſambúcus) and lauruſtinus (vibúrnum) are ſpecimens of the cyme. The term ſpadix is uſed to expreſs every flower-ſtalk, that is protruded from a ſpathe or ſheath; the family of palms have their flowers in a ſpadix, which is branched. The ſpadix of all other plants is ſimple. There is another term, which Linneus makes uſe of, which is rachis; this means only the ſtem, on which the flowers grow that form a ſpike; he calls it a thread-form receptacle, connecting the florets longitudinally into a ſpike.

Harr. O dear, mamma, I hope you will not think me very ſtupid, if I do not remember all theſe diſtinctions?

Hortenſ.

Hortenſ. I do not even expect that you ſhould underſtand them, until by examining the definitions of them with the plates of the different kinds of inflorescence they are made more intelligible to you; and when they are become ſo, you will with eaſe make them familiar to you, if, as you walk out with your brothers and ſiſter, you examine ſuch flowers, as you meet with, by thoſe definitions, of which you have made yourſelf miſtreſs.

Juliette. I am afraid of not remembering the hard names; but Henry will, and he will aſſiſt me.

Hortenſ. The hard names will become familiar to you by degrees. You muſt aſſiſt one another; we are all intereſted in the ſtudy; we ſhall converſe upon it, which will contribute more to your improvement than twenty leſſons learnt by rote. However, I would have you make a point of committing to memory what you learn in each of our lectures, and to form it into queſtion and anſwer, ſuch as, What is fructification? How many parts of fructification are there? &c. &c. this will amuſe and improve you at the ſame time. Botany is reckoned a dry ſtudy of names and terms; if the pupil finds

it

it ſo, it muſt be the fault of his teacher. You would not, any of you, have given your attention to me, if I had begun with teaching you only out of a book, and required you to remember all the numerous diſtinctions, without at the ſame time ſhewing you the natural objects, and acquainting you with their uſe and hiſtory.

Charles. I did not expect the amuſement I have found ſo early in the ſtudy. I am impatient to tell Mr. Wilſon how much I like it.

Hortenſ. You will like it ſtill better the farther you enter into it. We ſhall have the whole ſeaſon before us; and, I doubt not, ſhall be great proficients, if we make as good uſe of our time henceforward, as we have hitherto done. We will part for the preſent, as you have learnt ſufficient for one day.

Henry. I wiſh to-morrow was come. Now let us go into the garden, and try to put into order what we have learnt, and then we can queſtion each other in turns.

DIALOGUE THE THIRD.

Syſtem of Linneus explained. The firſt eighteen Claſſes, with their Orders explained.

Hortenſ. I am glad to meet you all again in our botanical room; by your countenances I judge that you have gone through your ſchool buſineſs well, and that we may proceed with our ſtudy of amuſement.

Henry. Yes, indeed, we may; Juliette and I performed our taſks ſo readily this morning, that Mrs. Pratt allowed us to meet Charles and Harriet in the alcove, where we have been together more than an hour looking at flowers, and aſking each other queſtions from the paper we formed yeſterday; do, mamma, look at it? I do think you will find we have remembered every thing you taught us.

Harr. The parts of fructification we readily remembered. What we found difficult yeſterday, we made out by the plates; and this morning we could all by turns anſwer the queſtions.

Hortenſ. You have managed it very well indeed, and I am pleaſed to ſee that you have rigorouſly obſerved my rule of placing the

botanical

botanical name with the common one of the flowers, you have had occaſion to mention.

Charles. We could not do this by memory, but were obliged to look for them in the botanical books, which however anſwered our trouble; for finding them accented in the tranſlated Génera Plantárum, we were no longer afraid of pronouncing them, and in a little time I dare ſay, we ſhall find the botanical names as eaſy to remember as the common ones.

Hortenſ. I wiſh you to attend to this; the confuſion ariſing from the neglect of the uſe of proper names is ſo great, that a knowledge of them cannot be too ſoon acquired, and their being accented makes it now not difficult to pronounce them.

Harr. I would rather all plants had Engliſh names; I ſhall be afraid of ſpeaking the botanical names though they are accented, leſt I ſhould be thought conceited.

Hortenſ. You may avoid that evil by a diſcreet uſe of them. Such cenſures are generally made by ignorant people, but cannot be juſtly incurred, unleſs you make a diſplay of your knowledge of the botanical names, by officiouſly uſing them for flowers univerſally

ſally known by their common ones: for inſtance, if inſtead of talking of a crown-imperial, you ſay you have gathered a fritilária imperiális; or for lily of the valley you ſay convallária, you will deſervedly be ridiculed both by the ignorant and well informed.

Harr. But why cannot there be Engliſh names to Engliſh plants at leaſt?

Hortenſ. This has been attempted, and has only ſerved to make more evident the diſadvantages of ſuch a plan. Genéric names are merely arbitrary, and ought to be equally familiar to botaniſts of every nation, which could not be the caſe, if family names were given in every language; perhaps it would be better if all names were baniſhed which are expreſſive of any particular quality, as this frequently tends to miſlead. In regard to an engliſh genéric nomenclature, many objections may be made to it; firſt, there are but few engliſh genéric names, which comprize all the plants belonging to the ſame family, ſouthern-wood, mug-wort, and worm-wood, have all an equal claim to become the family name of that genus, but have all been too long appropriated to each individual ſpe-

cies

cies to be now assumed for the name of the genus. The Linnean genéric name for this family, artemísia, includes them all; and by being thus ranked under a name not familiar to us, we feel no violence done to our old habits of considering them as distinct families. So the genéric name of clary does not seem to include the sages, nor the genéric name of sage to include the clary. Sálvia comprehends them all, and may be retained by the memory with as much ease as the english names. I will give you an instance, in which this attempt to establish english genéric names is productive of so uncouth an effect as, I think, will put an end to your desire to have it become general. The genéric name pyrus is adopted by Linneus for the family of pear, apple, and quince; in the attempt to an english nomenclature, pear is taken for the name of the genus, apple and quince for the specific names; hence we must speak of the pear-apple, the pear-quince, which could convey no distinct idea to a Linnean botanist, and must confuse an english one.

Harr. That would be very awkward indeed. I will no longer wish for the general use of english names; I always find, mamma,

you

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EXPLANATION OF PLATE III. PART I.

OF INFLORESCENCE.

Fig. 1. A Seed of Cucumber, *a*, before it is put into the ground. *b*, Beginning to germinate. *c*, *c*. The Cotyledons expanded. *d*, The Plume. *e*, The Radicle.

Fig. 2. The Seeds of Geranium, to ſhew the manner in which they are diſperſed. *f*, The Awns by which they are attached to the Piſtil.

Fig. 3. The common Receptacle of a Compound Flower.

Fig. 4, and 5. Different ſhaped Florets of Compound Flowers.

Fig. 6. The Wheel-form Corol of Verónica, to ſhew the narrow diviſion.

Fig. 7. A Petal of common Crow-foot. *g*, The Nectary.

Fig. 8, Shews a Tendril, *h*. Stipules, *i*. Glands, *k*.

Fig. 9. A Verticil.

Fig. 10. Head.

Fig. 11. A Spike.

Fig. 12. A Corymbe.

Fig. 13. A Thyrſe.

Fig. 14. A Raceme.

Fig. 15. A Panicle.

Fig. 16. Leaf-bearing.

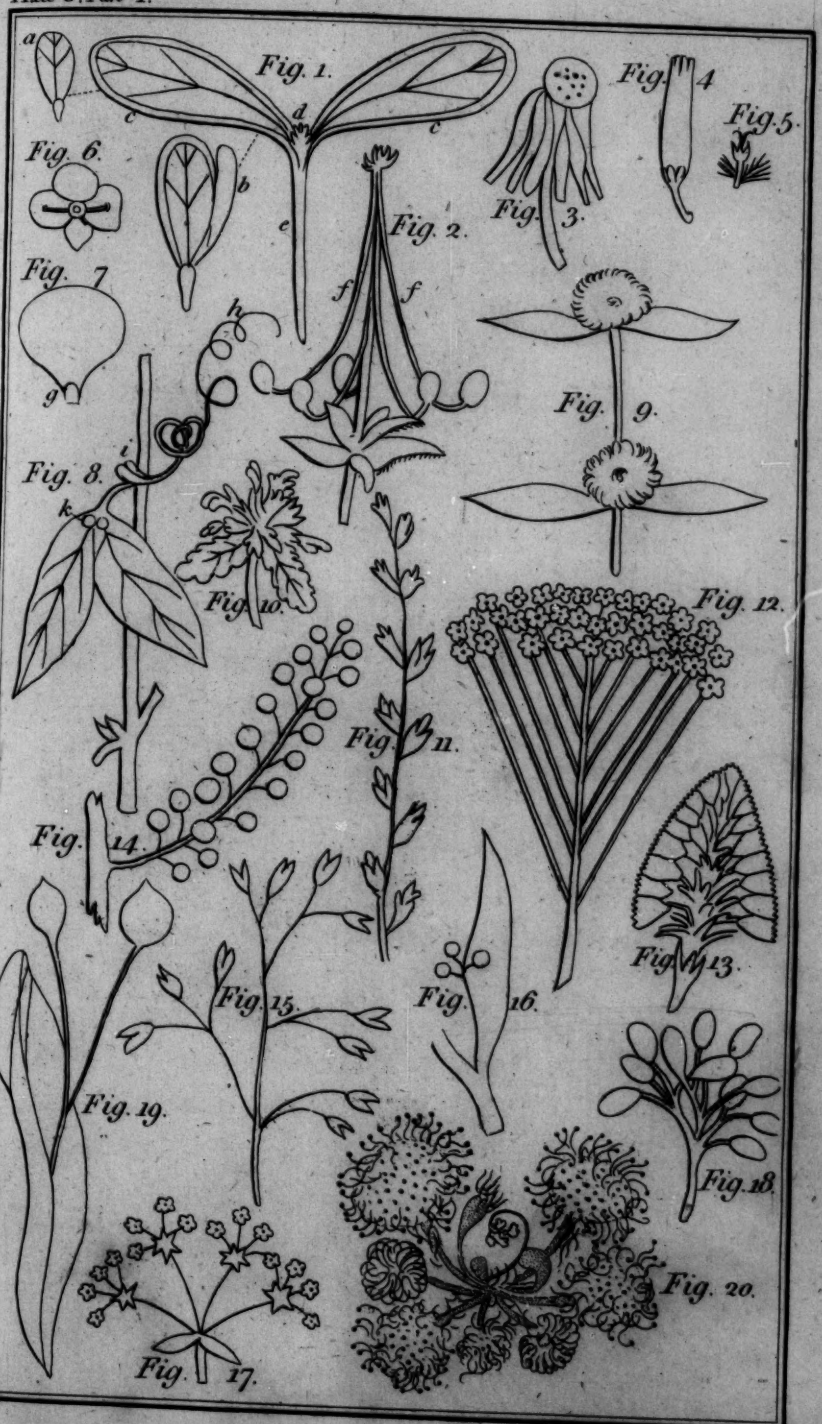
Fig. 17. An Umbel.

Fig. 18. A Cyme.

Fig. 19. A Bract, of Lime Tree (Tília Europæa) with the Capſules mature.

Fig. 20. A Plant of Dróſera.

Plate 3. *Part I.*



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MUSEUM

you are right; but I like to know ſometimes the reaſon why one thing is better than another.

Hortenſ. I alſo like to have you enquire: I never wiſh you to take any thing upon my authority, when objections ariſe in your mind againſt my opinions; this however requires diſcretion, and an attention to making your queſtions pertinent, and offering them with diffidence. Many of the Linnean names are already become familiar; they are now allowed to take the lead even in a work, where it had been attempted to eſtabliſh an engliſh génera; and in imitation of the Lichfield tranſlators, in their uſeful publication of the Génera Plantarum and Syſtem of Vegetables in an Engliſh Dreſs, the botanical names are accented. This muſt greatly facilitate the uſe of them; and it is much to be wiſhed, that Mr. Curtis would follow this example in his very agreeable work the Botanical Magazine, which from the information, it contains in its accurate plates, and the lowneſs of its price, being only one ſhilling each number, is in every body's hands, and has diffuſed a general knowledge of plants. Were the names in this work accented, it would tend greatly to

bringing them into univerſal uſe; even without theſe aſſiſtants we hear thoſe very people, who object moſt to the difficulty of them, ſpeak without heſitation of convólvolus, geránium, aſpáragus, campánula, and many other names, which are all of them the Linnean ones. Now we are all agreed upon the utility of endeavouring to eſtabliſh the common uſe of the botanical names, we will, if you pleaſe, begin with the Claſſes.

A Claſs is the firſt and higheſt diviſion of every ſyſtem. It may be compared to a dictionary, in which all the words having the ſame initial letter are arranged together, every word may be compared to a genus; the claſſic character is conſtituted from a ſingle circumſtance, as the words are arranged by a ſingle letter; this one circumſtance muſt be poſſeſſed equally by every plant admitted into the Claſs, how different ſoever they may be in other reſpects. This ſingle character is arbitrary, and has been taken from various parts of the fructification by different authors; ſome have choſen the petals, others the fruit; Linneus has made choice of the ſtamens, and on their number and ſituation has founded his claſſes; he makes the excellence of the

claſſic

claſſic character to conſiſt in its greater or leſs approximation to the natural one. The claſſes called natural are thoſe, which contain plants agreeing in a variety of circumſtances, ſuch as habit, manner of growth, uſes, and ſenſible qualities. The graſſes are a natural claſs; the compound, the pea-bloom, the croſs-form, the umbelled, and the verticilled plants are natural claſſes; ſo are the ferns. Though ſome of Linneus's claſſes are natural, moſt of them are artificial; this however I think of little conſequence; his ſyſtem has opened to our view a diſtinct knowledge of every plant that grows; it has given us a clear and ready method of referring an unknown plant, 1ſt, to its Claſs; 2d, to its Order; 3d, to its Genus; 4th, to its Species; and 5th, to its Varieties. Before we had this ingenious ſyſtem to guide us to a knowledge of the vegetable kingdom, all was confuſion. Much acuteneſs had been diſplayed in the inveſtigation of plants; but the labours of many ingenious men were rendered of little uſe from want of arrangement; they claſſed plants together, which had ſcarce any affinity, from a fancied reſemblance in imaginary virtues. Much uſeful knowledge has been loſt to

the world, almoſt all the medicines, and many of the arts of the ancients, we are now ignorant of, from their deficiency in the knowledge of botany.

Harr. But I think, mamma, I have often heard you ſay, what an ingenious man Dr. Grew was; and you are always entertained, when you look for plants in Gerrard's Herbal.

Hortenſ. Whoever is fond of the ſtudy of plants muſt feel grateful to Dr. Grew; he made his inveſtigations with ſo accurate and penetrating an eye, that much information may be found in his book on the anatomy of plants, particularly in the philoſophical part of botany; beſides, it is pleaſing to obſerve the coincidence of his opinions with thoſe of Linneus, in regard to the uſe of the parts of fructification. Gerrard's deſcriptions are full and ſtrong, and his language amuſing; but, for want of arrangement, I am bewildered, when I look for a plant in his Herbal; the various ſyſtems of modern botaniſts have deſervedly had their partiſans; but it now ſeems generally allowed, that the works of Linneus are beſt calculated to enable us to attain a knowledge of botany. He has divided

vided the vegetable kingdom into twenty-four Claſſes; the firſt ten Claſſes include the plants in whoſe flowers both ſtamens and piſtils are found, and in which the ſtamens are neither united nor unequal in height, when at maturity. Theſe Claſſes are therefore diſtinguiſhed from each other ſimply by the number of ſtamens in each flower, and may be known upon the firſt view by their numbers, as expreſſed by the words prefixed to the Claſſes: the firſt Claſs is known by the name of monandria, which ſignifies one-male, or one-ſtamen, the ſtamens being the part of fructification, which Linneus calls the male; ſo that the numerical word joined to the word ándria forms the titles of the firſt thirteen claſſes. Perhaps, Charles, you can with this previous information enumerate them to us?

Charles. I believe, Ma'am, I can, but I will own not quite fairly, as I caſt my eye over them yeſterday in the preface to the Botanic Garden, which lay open in Mr. Wilſon's room.

Hortenſ. In whatever way you may have come by your knowledge, we will be obliged to you to impart it to us. We expect you to

tranſlate for us; for male, you may ſay ſtamen.

Charles. I am to enumerate the titles of the firſt thirteen Claſſes:—monándria, one-ſtamen; diándria, two-ſtamens; triándria, three-ſtamens; tetrándria, four-ſtamens; pentándria, five-ſtamens; hexándria, ſix-ſtamens; heptándria, ſeven-ſtamens; octándria, eight-ſtamens; enneándria, nine-ſtamens; decándria, ten-ſtamens; dodecándria, twelve-ſtamens; icoſándria, twenty-ſtamens; polyándria, many ſtamens.

Hortenſ. We thank you; you have performed your taſk well; and we will not enquire whether your previous knowledge of language, or memory, has had the greateſt ſhare in your doing ſo.

Harr. Will it be neceſſary for me to learn theſe hard names to the Claſſes? I could readily remember the titles of one-ſtamen, two ſtamens; for they give me ſome idea of the flowers.

Hortenſ. I do not wiſh you to perplex yourſelf with them; but it will be uſeful to make yourſelf a little acquainted with terms, which you will meet with in moſt botanical books; and if you will take the trouble to fa-

miliarize yourſelf with them at firſt, you will ſoon find them appear not very uncouth to you.

Harr. I ſhall not think any thing too much trouble, that you recommend to me, Ma'am; but ſometimes I feel a little afraid of being found dull; and I think I have heard of botanical books written for ladies, which make all the hard words eaſy.

Hortenſ. There are ſome books, which pretend to do it; but the ſcientific terms are ſtill to be learnt, and when learnt, in the language of thoſe books, you cannot converſe with a Linnean botaniſt; they may make you a partial, but cannot make you an univerſal botaniſt. A knowledge of the tranſlated works of Linneus enables us to converſe with botaniſts of all nations, and to underſtand any botanical deſcriptions of plants, that we may meet with. Thoſe who have not induſtry ſufficient to ſtudy thoſe books, will learn the ſcience but ſuperficially from any. The complaint, that the tranſlated works of Linneus are hard, ariſes from not knowing how to ſtudy them. I have ſeveral times removed this difficulty by pointing out a method, and have been aſſured by my pupils who have

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adopted it, that they have learnt more readily from them than from all the pretty round-about ways, which have been adopted to level the ſcience to the capacity of ladies, and which, I think, ſerve only to confuſe. The method, by which I teach you, is the ſame, which I recommend for ſtudying the Lichfield tranſlation.

Harr. But then, mamma, we have you to explain all difficulties to us.

Hortenſ. That is true; and in conſequence of my aſſiſtance, you find the ſtudy more amuſing to you; but there are few perſons, who have not ſome friend, to whom they can apply, who can either reſolve theſe difficulties, or recommend books by which they may be removed. I am rather amuſed at the complaints of the young people of this age, of the hardneſs of the ſtudy, when ſo many books and plates of explanation are to be met with every where. Before the tranſlation of the ſyſtem of vegetables, they who wiſhed to make any proficiency in the ſcience of botany, were firſt obliged to learn Latin.---But to return to our Claſſes, the ten firſt of which, as I can ſhew you by a plate, are known by their number only; the eleventh Claſs is

called

called dodecándria, which you know ſignifies twelve-ſtamens. The reaſon of paſſing from ten to twelve is, that the number eleven has not been found ſufficiently conſtant in any flowers to form a Claſs. In the genus reſéda eleven ſtamens are ſometimes found, but oftener more; yet they never exceed fifteen. The eſſential character of the eleventh Claſs is, that the flowers belonging to it ſhall not have fewer than eleven ſtamens, nor exceed nineteen; added to this may be, that in this Claſs the ſtamens are fixed to the receptacle; whereas in the next, which has the title of twenty-ſtamens, icoſándria, though no more determined in point of number than the preceding one, they are attached to other parts of the fructification; their poſition it is alſo neceſſary to attend to in the thirteenth claſs; ſo that if we regarded only the titles of theſe three claſſes, we ſhould find ourſelves much confuſed.

Harr. Why then did Linneus give ſuch names to his claſſes, as were ſure to miſlead a young botaniſt?

Hortenſ. I am ſorry I cannot anſwer that queſtion ſatisfactorily; it ſeems that he might have given ſuch titles to the three laſt of the numerical

numerical claſſes, as would have been expreſſive of the circumſtances which diſtinguiſh them. I am ready to believe he had good reaſons for not doing ſo, as he was evidently aware of the defect in the titles he did give them, and as he has obviated the inconvenience, which would ariſe from the firſt character expreſſive of a decided number of ſtamens, by adding in the Key to his ſyſtem the ſituation of their growth, and by which circumſtance alone we can diſtinguiſh theſe three claſſes one from the other. The twelfth clafs, icoſándria, has generally twenty ſtamens, often more, which are inſerted on the calyx; there are alſo other more obvious characteriſtic marks, which may ſerve to diſtinguiſh this twelfth claſs from the following one, and which ſhould be attended to, as this contains moſt of the wholeſome fruits, and the thirteenth chiefly conſiſts of ſuch plants as are poiſonous. The plants of the twelfth claſs have a hollow calyx of one leaf, the corol faſtened by its claws to the inſide of the calyx, and, as I told you before, the ſtamens placed on the inſide of the calyx or corol.

Henry. So then, mamma, if I was in an unknown country, and found a plant bearing flowers

flowers with theſe marks, I might conclude it was of a wholeſome ſpecies.

Hortenſ. Your concluſion would probably be right, and might be of ſervice to you, as the fruits of the twelfth claſs frequently have their calyx remaining like a little crown on their top, when they are ripe; and while in a freſh ſtate, a ſkilful botaniſt may diſtinguiſh the inſertion of the ſtamens on the inner part of its leaves. The *thirteenth* claſs, many *ſtamens*, polyándria, has its ſtamens inſerted on the receptacle; their number being from twenty to one thouſand in the ſame flower. This claſs is the laſt of the numerical ones, or, more properly, of thoſe which have numerical titles; for we have ſeen that the character of the laſt three claſſes depends nearly as much on their ſituation as thoſe of which we are about treat. However we will proceed no further, till we have well underſtood theſe firſt thirteen claſſes with their orders; and then we will enter upon thoſe which are more difficult.

Harr. I am glad of that; for I have not got very clear ideas about the claſſes yet.

Hortenſ. You have yet only gone through the ceremony of introduction, and have not had

had time to form an acquaintance with them, which you will not find very difficult, if you will be content to ſtudy only a few of them at a time. I will introduce you to the firſt ſubdiviſions of the thirteen claſſes, which are called Orders, and then we will examine our plates, and ſome flowers with them. The ſubdiviſions or orders are founded on the number of piſtils, or on that part of fructification, which Linneus calls the female. If a flower contains one of theſe females or piſtils, it is of the firſt order; if it contains two, of the ſecond; and ſo on to any number that it may contain. The Linnean term for the orders is formed from the Greek word, which ſignifies a female, joined to another word expreſſive of the number; ſo that, as monándria ſignifies one-male or ſtamen, monogynia means one female or piſtil; digy'nia ſignifies two piſtils, which refers the plant to the ſecond order; trigynia ſignifies three, and ſo on to polygy'nia, or many piſtils. Do you think you can remember the titles of the claſſes and orders.

Henry. I think I ſhall remember them: I am to know to which of the firſt ten claſſes a flower belongs by the number of ſtamens, that

that I find in it, and to which order by the number of piſtils. Am I right, mamma?

Hortenſ. Quite right, only remember that a flower, to belong to any of the firſt thirteen claſſes, muſt contain both ſtamens and piſtils, and that the ſtamens muſt be at an equal height when at maturity. Henry has explained the firſt ten claſſes; there is yet one claſs left for each of you three to explain.---What is the character by which we are to know the eleventh claſs, Juliette?

Juliette. There are not to be fewer than eleven ſtamens, nor more than nineteen; and the ſtamens are to be fixed to the receptacle.

Hortenſ. Now, Charles and Harriet, you muſt tell me the characters of the twelfth and thirteenth claſſes, and the circumſtance which diſtinguiſhes one from the other.

Charles. The claſs icoſándria, or the twelfth claſs, has generally twenty ſtamens, often more, inſerted upon the calyx, which is of one leaf with the claws of the corol faſtened on the inſide of it.---Now, Harriét.

Harr. I will not be behind-hand with Charles with his hard words. The flowers of the claſs polyándria, or the thirteenth claſs, have ſtamens from the number of twenty to

one

one thouſand, which are inſerted on the receptacle. The orders depend on the number of piſtils. In all the numerical claſſes, the ſtamens muſt be of an equal height when mature, and the ſtamens and piſtils muſt be found in the ſame flower; but I will own, that I repeat more than I underſtand; for, finding myſelf confuſed, I reſolved to apply wholly to retaining what mamma told us, and truſted to underſtanding it when we came to look at the plates.

Jul. So did I; for you know, mamma, you have ſometimes adviſed us to learn things in this way.

Charles. I dare ſay I ſhall underſtand them better, when we have ſeen ſome flowers and the plates; but I think I have a clear idea of the poſition of the ſtamens in the three laſt claſſes.

Henry. I have often ſeen the ſtamens growing on the inſide of the calyx in apple and pear bloom; and yeſterday Charles and I pulled off the petals of a crow-foot, and the ſtamens all grew on the receptacle.

Hortenſ. You will find that an attention to theſe ſmall circumſtances will be of much uſe to you, as we proceed in our ſtudy.—When you

you are ſatisfied with examining the plates, we will go on with the claſſes.

Harr. We are all ready to attend, I believe, now, ma'am.

Hortenſ. The character which diſtinguiſhes the claſs didynamia, or the fourteenth claſs, is this, viz. that the flowers, of which it conſiſts, have four ſtamens, two of them being longer than the other two; hence it is called the claſs of two powers. The grinning and gaping flowers belong to this claſs. There are however two ſuch diſtinct natural aſſemblages of plants contained in it, that it would have been difficult to have brought them together from their affinity in any one circumſtance, but that which Linneus has arranged them under, viz. the curious poſition of their ſtamens. This claſs contains two orders, which are ſtrongly marked; the firſt gymnoſpermia, or that in which the flowers have their ſeeds naked, being contained in the bottom of the calyx; and the ſecond order, angioſpermia, having the ſeeds covered or contained in a pericarp. The whole appearance of the flowers belonging to theſe two orders is perfectly different: what can be more

more ſo than the fox-glove (digitális), and lavender (lavéndula), or thyme (thymus). Yet the croſs-form growth of the anthers, with the unequal poſition of the ſtamens, may be found in them all. The next claſs, tetradynamia, or the fifteenth claſs, has ſix ſtamens, and is called the claſs of four-powers: theſe ſix ſtamens not being of an equal height, four being taller, and the two lower growing oppoſite to each other. This claſs contains the croſs-form flowers, and is a really natural claſs. Linneus has admitted only one genus into it, which can be at all objected againſt, that is the genus cleóme, in many ſpecies of which there are more than ſix ſtamens, and theſe not in the regular proportion of length, which gives the name of four powers to the claſs, ſo that it ſeems that the family of cleóme has no right to be admitted into it, unleſs the affinity of its nectaries to thoſe of the croſs-form flowers may be allowed a ſufficient title. This claſs is divided into two orders, which are diſtinguiſhed by the form of their pericarps, or ſeed-veſſels; the firſt order having its ſeed-veſſels of the Silicle kind, the ſecond of the Silique; the

Silicle

Silicle being furniſhed with a ſtyle, often the length of itſelf, the Silique with a ſtyle ſcarcely viſible. What is the difference, Henry, betwixt the ſhape of a Silicle and a Silique?

Henry. The Silicle is roundiſh, but the Silique is long; I think honeſty has a Silicle for its ſeed-veſſel, and that the ſeed pod of muſtard is a Silique.

Hortenſ. You are quite right. The ſilicle of honeſty, when mature, is a great ornament to the plant; from its ſhining appearance, like white ſattin, it has received its botanical name of lunária, or moonwort. There is a good deal of variety in the forms of the ſilicle kind of ſeed-veſſel; that of lunária, you know, is nearly round; there are others which are oval: the ſmall ſilicle of ſhepherd's purſe (thláſpi) is triangular, and notched at the top, and reſembles a little heart; the circumſtance of being notched or plain makes two diviſions of the ſilicle order, and thence renders the inveſtigation of the genéra belonging to it a leſs difficult taſk. She ſeed-veſſel of lady ſmock (cardamíne) is a ſilique, and alſo that of radiſh (ráphanus). Some of

theſe ſiliques form very pretty ſkeletons, in the ſame manner as the holly leaves that you pick up in winter, and which you ſo much admire. The ſixteenth claſs, monadélphia, or one-brother-hood, is ſo called from the flowers belonging to it having all their ſtamens united at the baſe into one company, ſurrounding the piſtils. The ſtamens and piſtils in the flowers of the ſixteenth claſs add much to the beauty of the fructification; they ſtand like a little pillar in the centre of the flowers, from which circumſtance Linneus in his Natural Orders has named them column-bearing. The anthers have a marked character, which contributes to their ornament, being ſhaped like a ſmall kidney, and attached to the filaments by the middle in ſo ſlight a manner, that they appear rather to lie upon than to be fixed to them. The piſtils are encloſed by the ſtamens, till they begin to advance towards maturity, when they burſt forth, and form an elegant taſſel, a little above the ſurrounding anthers: in the china roſe (hibíſcus) this taſſel is particularly beautiful; the rich crimſon piſtil riſes rather higher than uſual above the golden anthers, which

which encircle it, and dividing into five filaments at top bends down its round ſtigmas amongſt them; theſe ſtigmas then have the appearance of the richeſt crimſon velvet ſpangled with gold.

Jul. I think I have obſerved the brightneſs of its colour, but am not ſure it was that which you deſcribe; I think it was double. Pray, mamma, ſhew us the firſt hibiſcus that flowers.

Hortenſ. You ſhall ſee the firſt, that we can gather. The double hibiſcus moſt people are fond of cultivating, but it is very inferior in beauty to the ſingle. As the ſixteenth claſs is founded on the ſituation of the ſtamens, ſo are the orders on their number, beginning with the number three, and ending with that of eleven. The claſs diadélphia, or two-brotherhoods, the ſeventeenth claſs, is perfectly natural, and the ſtructure of the corol ſo remarkable, that the outer habits of its flowers are ſufficient to diſtinguiſh them; but, according to the Linnean ſyſtem, it is neceſſary to have recourſe to the ſituation of the ſtamens, which is their being united into two ſets; this claſſic character is however to

be traced with difficulty, for what is termed one of the ſets conſiſts only of a ſingle filament; but Linneus has made this ſeparation of the ſtamens of ſuch eſſential conſequence, that he has not admitted into this claſs the genus ſophóra, which has all the outward habits of the tribe belonging to it, except having its ſtamens ſeparate, therefore he has placed it in the tenth claſs. The orders, or ſecondary diviſions of the ſeventeenth claſs, are founded upon the number of ſtamens, without any reference to their union; the ſingular ſtructure of the corol having made it neceſſary to diſtinguiſh each ſeparate part by a name peculiar to itſelf, the broad ſpreading petal at the back of the corol is called the Banner; the ſide petals, the Wings; and the two petals, by which the ſtamens are encloſed, are termed the Keel, from the reſemblance of their form to the keel of a boat. The ſhape, and other circumſtances attending theſe different parts, are found of uſe in diſtinguiſhing the génera of this claſs from each other; but the calyx is of moſt ſervice in this important office; it is to this claſs of plants that the legume ſeed-veſſel belongs. Henry explained

plained the ſilicle and ſilique; do you, Juliette, tell us the mark of diſtinction betwixt the legume and ſilique?

Jul. I think that in legume the ſeeds are fixed only on one ſide, and that in ſilique they are fixed on each ſide alternately.—Pray, mamma, let us examine a pea flower in all the different parts, which form the corol?

Hortenſ. When we have finiſhed our morning lecture, we will imprint it upon our memories, by talking over what we have learned, and by comparing flowers with plates of their various parts, and with the deſcriptions, which I have given you of them. We will now go through the eighteenth claſs, and then leave the remaining ſix claſſes for our next meeting. The eighteenth claſs is called Polyadélphia, or many-brotherhoods, the flowers contained in it having their ſtamens united into diſtinct ſets. St. John's wort (hypéricum) ſhews the diſpoſition of the ſtamens very plainly; they may, with very little attention, be taken off in little bunches: the orders of this claſs depend on the number of ſtamens, or more properly on the number of an-

thers in each flower, as ſome of the génera have five anthers on each filament: indeed this is a circumſtance, which ought always to be attended to, the ANTHERS and STIGMAS being the eſſential parts of the STAMENS and PISTILS. If they are preſent, it is ſufficient to place the flower, they belong to, in the claſs or order, to which their number refers it. I am afraid you do not find the claſſes ſo amuſing, as you flattered yourſelves you ſhould have done.

Harr. I acknowledge, that I am not ſo well amuſed by them, as I was with what we before learned; but I am not at all tired, and ſhould like to go on, only I think I ſhall better underſtand, what we have now heard, by ſtudying the plates, before we proceed further, than if we attempted to learn the outline of all the claſſes together.

Charles. So do I; for if we can attain a clear idea of the claſſes, that we have learned, we may begin to practiſe our knowledge, and that we ſhall all like.

Henry. That we ſhall; and I hope we ſhall have time to-morrow morning to meet in the alcove.

Jul.

Jul. I hope ſo too. Now, mamma, let us have the plates, and we will claſs all the flowers at our next lecture.

Hortenſ. If you do, I ſhall think you great proficients; it gives me pleaſure to find, you all ſo well entertained. You underſtand the firſt thirteen claſſes; the plates, that we muſt now look at, muſt be thoſe of the five claſſes, that we have juſt now been conſidering.

DIALOGUE THE FOURTH.

Examination of Flowers belonging to different Claſſes. The Claſſes 19, 20, 21, and 22 explained.

Hortenſ. I have obſerved, you all very buſy in your alcove, and have great expectations from the reſult of your reſearches, particularly as yeſterday you were all ſo ready in the theory of the claſſes.

Jul. Ah, mamma, you laugh at us, when you ſay, you expect great things. You knew the difficulties we ſhould find in practiſing our knowledge: I boaſted too ſoon; but indeed I expected to claſs the flowers quite readily; now I am afraid I ſhall be a great while, before I can make any thing of them.

Hortenſ. Your imagination went a little too rapidly; a few years will teach you, that it is by time and attention only we can learn any thing; and that there are very few people, if any, who are able to ſeize upon knowledge in a moment. You now ſeem to doubt your powers as much too haſtily, as before you truſted in them; and, I dare ſay, when I come to know what you have all done, I ſhall be ſatisfied.

Harr.

Harr. I do believe, mamma, you will; but it is becauſe you will not expect much; if Juliette had not been diſcontented, I ſhould have been a little vain of our performances. We cannot make out, to what claſs the plantain belongs; and ſome graſs, we have gathered, puzzles us, and Juliette thinks this very ſtupid.

Hortenſ. The graſſes I adviſe you not to think about at preſent; they muſt be ſtudied at firſt by themſelves. Plantain (plantágo) you have probably been puzzled with, by not taking it in a good ſtate for inveſtigation; the beſt time to examine the number of ſtamens is juſt before they burſt forth; after the anthers are mature, it is difficult in many flowers to diſtinguiſh their number. Be ſo good to give me your plants in order according to their claſſes.

Charles. We have had great doubts about this mare's-tail; firſt we thought there was no flower; then we recollected, that an anther and ſtigma muſt be eſteemed a flower; and, on very cloſe examination, we diſcovered a ſtamen and piſtil at the bottom of each leaf, which grows round the ſtalk; but we are not yet quite ſure, whether we muſt conſider

ſider this as one flower, or reckon the number altogether, that forms the whorl; but we think it belongs to the firſt claſs and order.

Hortenſ. You are right in your conjecture; greater ſimplicity in the ſtructure of a flower can ſcarcely exiſt than in this plant, which is the hippúris vulgáris, or mare's-tail; it has neither calyx, corol, nor ſeed-veſſel; and thoſe parts, which are moſt eſſential to the fructification, are as few as poſſible; there is one ſtamen, one piſtil, and one perfect ſeed; the ſtalk cut acroſs is a curious microſcopic object; we will look at it preſently. Juliette may conſole herſelf for not being able to claſs the plantain and graſs, as, on the firſt eſſay, I ſhould not have expected any of you to have claſſed the hippúris; but your having done ſo proves, how much we may learn, when we have a real deſire to underſtand a ſubject, and give proper attention to it. Theſe verónicas are right, they belong to the claſs two-ſtamens, diándria, and the order one piſtil, monogynia. Theſe graſſes belong to the third claſs, but you have gathered them too far advanced in flower; we will think no more about them, till we underſtand all the claſſes. This cro-

cus belongs to triándria, or three-ſtamens; but to what order have you referred it?

Harr. We are not all of the ſame opinion; though at firſt when we gathered the flowers, we all thought it belonged to the third.

Hortenſ. The deep diviſions of the ſtigma give the flower the appearance of having three piſtils, if however you take off the other parts of fructification, to do which you muſt take the root out of the ground; you will find one very long piſtil within the tube of the corol; your plaintain like the graſſes you have gathered too ripe. You ſhould collect ſeveral flowers of the ſame kind at different degrees of maturity. Pray bring a few flowers of what you call the fighting cocks, which is a plantago, and I will convince you it belongs to the fourth claſs.

Henry. I have brought ſeveral in different ſtates; I think I ſee four ſtamens now.

Hortenſ. You recollect that thoſe four ſtamens muſt alſo be of equal heights to place your flower in the fourth claſs (tetrándria). Obſerve, now I touch them with this fine needle, the unfolding of the filaments, which bear the anthers, and how cloſely they lie doubled

doubled within the corol, that they may be preſerved free from injury, till they become mature.

Jul. We cannot claſs this parſley.

Hortenſ. I have rarely had occaſion to reprove you, Juliette; but for the chagrin you give way to, when you do not excel in the degree you expect to do; I fear this diſpoſition proceeds from pride rather than modeſty, and much wiſh you to get the better of it. I ſhould be ſorry to be obliged to loſe you from our party; but if this diſcontent is indulged every time, you cannot refer a plant to its proper claſs or genus, it will render you a very troubleſome companion. Good humour is to be valued far above all other acquirements, and I would rather you were a dunce than that you ſhould be fretful. The parſley (ápium), the flower in queſtion, is a difficult one to claſs: it is not eaſy in the umbel-bearing plants to find the ſtamens in a proper ſtate for inveſtigation; they alſo differ in number, in which caſe the flower, which terminates the umbel, is to be examined, and, according to the number of ſtamens contained in that, is to be claſſed. The difficulty of variety in the number of ſtamens in the

the ſame ſpecies too frequently occurs in the flowers of the claſs pentándria, and is a perplexing circumſtance to young botaniſts; but as nature commonly preſerves a certain proportion through all the parts of the ſame work, you may generally diſcover the claſs to which a flower belongs by attending to the numbers of the other parts of fructification. Should you find a flower, which has its calyx divided into five parts, and its corol conſiſting of five petals, though its ſtamens ſhould exceed or fall ſhort of the number five, you may conclude, that it belongs to the fifth claſs: and if you examine a few more flowers of the ſame ſpecies, or even of the ſame plant, you will ſee, that five ſtamens are the moſt conſtant number belonging to ſuch flowers, and need no longer heſitate to refer them to the claſs pentándria. The umbelled plants are improper ſubjects to begin with from the minuteneſs of their parts of fructification. I adviſe you to chooſe the larger kinds of flowers, and thoſe of the moſt ſimple conſtruction; and when you are become familiar with their claſſes and orders, then endeavour to make yourſelves acquainted with thoſe, which are more complicated. In this

this unopened umbel of parſley I can ſhew you plainly, that your plant belongs to the claſs five-ſtamens (pentándria), and to the order two-piſtils (digy'nia). The two rough ſeeds, you obſerve, have no veſſel appropriated to contain them; but in thoſe umbels, which have done flowering, are encloſed by the calyx. The art of gardening has rendered many of the umbelled tribe of plants uſeful to us in cookery; which in their wild ſtate are too acrid to be palatable food. Your parſley is of the ápium genus, diſtinguiſhed by the ſpecific name petroſelínum. Linneus gives only two ſpecies of the ápium genus; the ſecond, ápium graveolens, is the ſmallage, which, though in little requeſt in its natural ſtate, is of much conſequence, when it has undergone the proceſs of cultivation, as from it we derive our celery; but whether from the ſpecies, which grows on the ſides of brooks in our own country, or from what has originally been brought from a warmer climate, is not decided. You have, I dare ſay, watched the proceſs of blanching celery, by earthing up the root and lower part of the leaves, and thus by depriving them of the air they are rendered white and mild, and

the parts of the plant covered by ſoil converted into ſolid root, which is the eatable part.

Henry. I have often been with the gardener, when he has earthed up celery, but I did not think much about it. Pray, mamma, are this woodbine and lungwort of the claſs five-ſtamens, and the order one piſtil?

Hortenſ. They are; ſo are this ſnow-drop (galánthus), cheſnut (éſculus), and mezereon (daphne), of the ſixth, ſeventh, and eighth claſſes, and of their firſt orders. The claſs of nine-ſtamens (enneándria) contains only ſix génera. There is but one britiſh ſpecies known, which belongs to this claſs, that is the bútomus, or flowering ruſh, and this is not to be commonly met with. Your ſpecimens of the ten-ſtamens, decándria, and the ſecond and fifth orders, monogynia, and pentagynia, one piſtil, or five piſtils, are right in this ſaxifrage (ſaxífraga) and wood-ſorrel (óxalis). You are puzzled, I ſuppoſe, by thoſe campions (ly'chnis), as you have let them lie on the table?

Charles. We found ſtamens in their flowers, but could not find piſtils, ſo we thought they might belong to ſome of the claſſes we have

have yet to learn; but we brought them to aſk you about them, ma'am.

Hortenſ. By a ſtrict obſervance of Linneus's rules this lychnis could not be placed in the tenth claſs, as that requires the preſence of both ſtamens and piſtils in the ſame flower; however he has himſelf placed it there, being found to agree with the reſt of its family in every particular but that of its ſtamens and piſtils being on the ſame plant; rather than ſeparate it from them, he has taken this circumſtance for its ſpecific character. This, and a few more inſtances of the ſame kind, may certainly be conſidered as defects of the ſyſtem; but the inconvenience that might ariſe from ſuch a violation of the general rule, by which the claſſes are characterized, is obviated, as much can be, by being noted, whenever ſuch contradiction occurs.

Harr. Be ſo good, mamma, to look at this willow-herb and churn-ſtaff: we think the willow-herb ought to belong to the eleventh claſs, but are puzzled by the churn-ſtaff?

Hortenſ. You are fortunate in the ſpecimen of your willow-herb (ly'thrum), as it is ſubject to vary in its number of ſtamens, which

which ſhews you the neceſſity of examining many flowers of the ſame genus. The churn-ſtaff (euphórbia) belongs alſo to the eleventh, or dodecándria, claſs; but we will defer the examination of it, till we begin with the gé-nera of flowers. Your pear (pyrus) and ra-núnculus you were ready in, having before examined the poſition of their ſtamens: take this hawthorn (cratœgus), and this phea-ſant's eye (adónis), Juliette, and refer them to their proper claſſes.

Jul. I think the hawthorn belongs to the twelfth claſs, the ſtamens are fixed to the ca-lyx, and this pheaſant's eye muſt belong to the thirteenth, for here they grow on the re-ceptacle.

Hortenſ. Very well anſwered, now let me look at your ſpecimens of the fourteenth, fif-teenth, and ſixteenth claſſes, with their or-ders, which, as they no longer depend on the number of piſtils, will require more at-tention.

Charles. We gathered a dead-nettle, and a ſnap-dragon, to ſhew both orders of the claſs two-powers; the four naked ſeeds of the dead-nettle place it, I ſuppoſe, in the firſt or-

der; and the ſeed-veſſel of the ſnap-dragon refers that to the ſecond.

Hortenſ. Certainly. Of what ſpecies of pericarp, or ſeed-veſſel, is this of the ſnap-dragon (antirrhínum), Henry?

Henry. A capſule, I think; it is dry and hollow: how like a monkey's face it is!

Hortenſ. Thoſe two holes, which open at the top to let the ſeeds out, give it a curious appearance. This whitlow-graſs (drába) is right, both as to its claſs and order; its ſilicle referring it to the firſt diviſion of the claſs four-powers (tetradynámia), as this ſilique of purple rocket (héſperis) places it in the ſecond. We eat many of the plants belonging to this claſs; ſome without cookery, as water-creſs (ſiſy'mbrium) and muſtard (ſináp̆is); others are rendered mild by boiling, as cabbage, turnep, brocoli, cauliflower, and ſome others; all of which are the produce of cultivation from one genus, bráſſica.

Jul. I have eaten of them without a thought of what they came from. I ſhall now always want to know the hiſtory of the vegetables at dinner. You told us at firſt, mamma, that we could not learn botany without, at the ſame time, learning to think.

Hortenſ. And you have found it ſo. The change produced in vegetables by the art of gardening is curious, and will not be the leaſt amuſing part of our ſtudy. The flowers of the three laſt claſſes, we have to conſider, are ſtrongly marked. The geránium and mallow (málva) are right ſpecimens of the one-brotherhood claſs (monadélphia); attempt to take off the ſtamens, you will ſee they are firmly united at their baſe; this genus has many ſtamens, therefore is of the order ſo called, or polyándria. Take off a few flowers from this *large lupine*: the form of its flowers marks it to be of the diadélphia, or ſeventeenth claſs; but we muſt examine its ſyſtematic character. You ſee nine of the ſtamens are ſeparated from the tenth, and cloſely united at the baſe; this Linneus calls *two-brotherhoods*, though by that term we ſhould be led to expect a more equal diviſion of the number of ſtamens. I will ſhew you a curious circumſtance reſpecting the flowers of common broom (ſpártium ſcopárium).—The males, or ſtamens, which are ten in number, are more equally divided into two ſets, one riſing a quarter of an inch above the other; the upper ſet does not arrive at

maturity ſo ſoon as the lower, and the ſtigma, or head of the female, is produced amongſt the upper or immature ſet; but as ſoon as the piſtil grows tall enough to burſt open the keel-leaf, or hood of the flower, it bends itſelf round in an inſtant like a French horn, and inſerts its head, or ſtigma, amongſt the lower or mature ſet of ſtamens, as you may ſee by touching the keel-leaf; the piſtil continues to grow in length, and in a few days arrives again amongſt the upper ſet, by the time they become mature. This wonderful fact is given in the note on geniſta in the botanic garden, and might, I think, have made ſome agreeable lines in the poetry.

Harr. This is very curious: how quick the piſtil moves, when I touch the keel-leaves!

Hortenſ. Can any of you tell the names, which belong to the different parts of this broom flower?

Harr. I believe we all can; but Henry looks, as if he would like to explain them: would not you, Henry?

Henry. Thank you, Harriet. This large petal at the back is called the banner; the ſide petals the wings; and theſe two petals, which ſhut up the two ſets of ſtamens and the

the piſtil, are ſo like the bottom of my little boat, that I cannot forget they are called the keel.

Hortenſ. You are ſo ready in your leſſon, that I am not ſurprized, that you ſhould be deſirous of repeating it. Pray give me the ſpecimen you have gathered of the eighteenth claſs? Polyadélphia, or many brotherhoods.

Charles. We could not find any flower, except the hypéricum, that ſeemed to belong to that claſs; and you know, ma'am, you had told us it did ſo; however we brought it: how beautiful its ſtamens are! They are like a fine yellow ſilk taſſel with the ends tip'd with crimſon beads.

Hortenſ. It is a handſome flower: the hypéricum is the only Britiſh genus which belongs to the claſs of many-brotherhoods; it muſt alſo be of the fourth order polyándria, or many ſtamens. When you walk out, you may gather ſome orange flowers in the green houſe; the orange, lemon, and citron all belong to the genus cítrus, which is of this claſs, and of the third order, icoſándria, having twenty ſtamens; but ſo different is the appearance of the ſtamens to thoſe of hypéricum, that a young botaniſt would not ſup-

poſe them to be of the ſame claſs, though on inveſtigation the ſtamens will be found ſeparated into ſmall bundles. We muſt now quit this more agreeable practical part of our ſtudy, and return to the theory of the claſſes.

The claſs ſyngeneſia, or united anthers, is founded on the very peculiar ſituation of the anthers, which are joined together in the form of a cylinder, while the filaments remain diſtinct; by ſlightly preſſing this cylinder of anthers at the top, you may bend their filaments ſo as to have the appearance in the larger flowers of thoſe open paper baſkets, which Juliette was cutting laſt night; the number of ſtamens ſo united is five; they form a ring round the piſtil, which riſes in the midſt of them, and ſeems conſcious of the homage ſhe is receiving. This claſs conſiſts of what are called the compound flowers, and is certainly a natural one, if we except a few génera which are contained in the laſt order, and which are placed in this claſs from the ſingle circumſtance of having their anthers united in a cylinder; one of theſe génera is the víola, under which the violet and panſie are ranked: we will allow this to be a fault in the ſyſtem, and at preſent conſider

ſider only the compound flowers: Linneus makes the eſſence of a compound flower to conſiſt in the union of its anthers into a cylindric form, one ſeed being placed on the receptacle beneath each floret. A compound flower is ſo called from being compoſed of many ſmall flowers or florets, which are fixed on a common receptacle, and encloſed by a common calyx. Theſe florets vary greatly in their contents of the ſtamens and piſtils, and alſo in the form of their corols, which in ſome florets is tubular, in others flat, which is called tongued. In the ſame flower ſometimes the border of the corol is wanting, and ſometimes there is not even a tube. On the variety of form in the corol is founded, in part, the generic character. On the florets bearing ſtamens, or piſtils, or both, are founded the firſt four orders. If all the florets of a compound flower are found to contain ſtamens and piſtils, it muſt then be referred to the firſt order: if ſome of its florets contain ſtamens and piſtils, and others only piſtils, you muſt look for your flower in the ſecond order: to the third it will belong if the florets in the *centre* have both ſtamens and piſtils; and if thoſe in the circumference be

deſtitute of either. The fourth order depends alſo on the florets in the centre having both ſtamens and piſtils; but from ſome defect in the piſtils, producing no ſeed, the florets in the circumference having only piſtils, and producing ſeed. The fifth order is not diſtinguiſhed by any circumſtance belonging to the ſtamens and piſtils, but by the florets being ſeparated from each other, by being encloſed in a partial calyx, all the florets being contained in a common one, ſo as to form one flower. The character of the ſixth order is derived from the form of its flowers being ſimple, which perhaps ought to have excluded them from this claſs; but as they agree with the compound flowers in the eſſential character of the united anthers, Linneus has placed them in it; and as the principle of the ſyſtem on which he has founded his claſſes does not pretend to make them natural, I do not ſee any great objection to it.

Harr. Mamma always defends Linneus.

Hortenſ. I have received ſo much amuſement from his labours, that I ſhould be ungrateful not to conſider his defects with candour; his life was ſpent in laborious reſearch into natural hiſtory, by which the botanical world

world has been ſo materially benefited, that it ought at leaſt pay the tribute of gratitude to his memory, however gratitude is not excluſively due to him; much was done by his predeceſſors, and you will ſometime have pleaſure in underſtanding the ingenious ſyſtem of Tournefort, but at preſent we are to think only of Linneus as our great maſter. The characters of the orders of the claſs ſyngeneſia, United Anthers, are too complex to retain in your minds without having examined ſome flowers belonging to them, therefore we will do ſo before we proceed further. Pray gather ſome dandelions (leóntodon), thiſtles, cárduus, and a few of any flowers which, from their outward habits, you ſuppoſe to be of the compound kind; alſo a few panſies and violets.

Charles. I have brought a large collection of flowers. You, ma'am, will be ſo good to ſeparate them, and explain the orders they belong to?

Hortenſ. I perceive you have brought ſome flowers of the ſcabious (ſcabióſa). Its mode of infloreſcence in outer appearance nearly reſembles the compound flowers; it however be-

belongs to the fourth of the numerical claſſes. On examination you will find marked diſtinctions of character between them: the ſcabious, and ſeveral other génera of the ſame habits, have their four ſtamens ſeparate; the compound flowers, as you ſee in this thiſtle (cárduus), have their *five* anthers united in a cylinder; there is alſo another difference, theſe flowers of the fourth claſs have the florets, of which they are compoſed, attached to the common receptacle by a ſmall peduncle, or foot-ſtalk; the florets of the compound flowers are ſeſſile, or fixed to the common receptacle by their baſe, without the intervention of a peduncle; the ſcabious, and that tribe of flowers, which have not the eſſential mark of the United Anthers belonging to the compound flowers, are called aggregate.

Charles. I ſee a very great difference betwixt the ſtamens of this thiſtle and thoſe of the ſcabious. I am glad, I brought the ſcabious, having compared them will mark the character of the ſyngeneſia claſs on my memory.

Hortenſ. This thiſtle (cárduus) and dandelion

lion (leóntodon) both belong to the firſt order; examine them, and tell me why they do ſo?

Charles. The florets of this thiſtle all contain both ſtamens and piſtils, and that, I believe, refers it to the firſt order.

Jul. So do the florets of this dandelion; I begin to have ſome idea of the character of the orders now.

Hortenſ. I will give you the flowers according to their orders, and you will then more eaſily remember the marks, which diſtinguiſh them. Here is a flower for each of you. The daiſie (béllis), blue bottle (centauréa), mary-gold (caléndula), and globe thiſtle (échinops).

Charles. The daiſie has florets, with ſtamens and piſtils in the centre; but thoſe in the circumference have only piſtils, this muſt go to the ſecond order.

Harr. My blue bottle has both ſtamens and piſtils in the central florets, but I cannot find either in the circumference; according to the order you gave it me in, ma'am, this muſt be the character of the third diviſion.

Jul. This mary-gold has both ſtamens and piſtils in the florets of the centre, and piſtils only

only in the circumference; this is like the daiſie; I cannot be right, for it ought, I ſuppoſe, to belong to the fourth order, and I can only find the marks, which refer it to the ſecond.

Hortenſ. You are perfectly right, ſo far as you go; but there is another character to be attended to in this fourth order: look at your mary-gold again; you will not find any appearance of ſeeds in the central florets, but in thoſe of the circumference you will ſee large ones, flat, and in the form of a heart. This circumſtance of the florets with and without ſeeds, is the eſſential character of the fourth order. I did not expect you to retain theſe minute diſtinctions; to remember the claſs and orders of ſyngeneſia, it is neceſſary to make ourſelves acquainted with the flowers. Now, Henry, tell us the character of the fifth order, to which your globe-thiſtle belongs?

Henry. I remember about that; the florets ſhould be all in ſeparate calyxes, and all contained in one common large calyx; ſo they are here: I love a globe-thiſtle; when it is in full flower it looks like net-work.

Hortenſ. The ſixth order, you all recol-

lect,

lect, depends on the ſingle circumſtance of the United Anthers. Obſerve the ſtigmas of this violet and panſie; they are both of the genus víola, which is ſeparated into two diviſions from the peculiarity of their ſtigmas; that of common violet being reflected into a ſimple hook, and that of the panſie (or three-coloured víola) being round and perforated. Jaſíone, or ſheep ſcabious, is placed in this order of ſimple flowers, to which it certainly cannot belong, being compoſed of many florets; nor is there any circumſtance reſpecting its fructification, which gives it any pretence to be claſſed with the compound flowers, except that of its five anthers being ſlightly connected at their baſe, for they are not united in a cylinder: from the firſt view of this plant it ſeems to be of the tribe called aggregate, but, on examination it differs eſſentially from them in the numbers of its fructification, and other circumſtances. The Jaſíone puzzled me much, when firſt I ſtudied botany, and I am not now ſatisfied about it. Have you ſtudied this claſs ſufficiently to make you underſtand it?

Harr. I dare ſay we have, ma'am; though preſently,

preſently, if you pleaſe, we ſhall like to look at ſome plates.

Hortenſ. You ſhall do ſo. There is a curious circumſtance in regard to the calyx of moſt of the compound flowers, though not belonging to all, which is worthy of attention. When the florets become mature, they burſt open the common calyx, which contains them; as ſoon as the ſtamens and piſtils of theſe florets have done their office, they wither with the corols, the common calyx then riſes, and encloſes the remaining parts of fructification, till the ſeeds arrive at that ſtate of ripeneſs, which makes them ready for diſperſion; the hairy down, by which they are crowned, then expands, and again burſts open the calyx, ſo as to bend its leaves quite back, and, by the help of this down, the ſeeds are carried by the wind to a conſiderable diſtance.

Jul. We know when the ſeeds of dandelion are nearly ripe, and ready for our canary birds: when we ſee the white down coming out of the calyx in a little tuft, it is always near flying, when it does ſo; it is very pretty when quite ripe, and what we call a clock.

Hortenſ. Thoſe compound flowers which have

have their ſeeds furniſhed with a downy pappus, take a variety of elegant forms; and the claſs of United Anthers, though difficult at firſt to ſtudy, amply repays our trouble in attaining a perfect knowledge of it, from the curious mechaniſm of its flowers. The ſtructure of the ſtamens and piſtils of the claſs gynándria, or twentieth claſs, is ſo extraordinary as to be ſuppoſed by Linneus to occaſion the unuſual appearance of the flowers belonging to it. The órchis tribe, paſſion flower, (paſſiflóra) and árum, which you call lords and ladies, are of this claſs: the eſſential character of which is the ſtamens growing on the ſtyle, or on the receptacle elongated into the form of a ſtyle, bearing the piſtil with the ſtamens, and becoming a part of the piſtil, which part you muſt firſt conſider to obtain a diſtinct idea of the ſituation of the ſtamens. This claſs contains nine orders, founded on the number of ſtamens in each flower. The firſt order, which is called diándria, or two-ſtamens, is natural; the génera differing from each other almoſt only in the Nectary. The ſtructure of the fructification of this order is very ſingular; for the germ, always beneath, is contorted: the petals are

five,

five, of which the two inner converge, ſo as to reſemble an helmet: the under lip conſtitutes the Nectary, which occupies the place of the piſtil and ſixth petal: the ſtyle grows to the inner margin, and can ſcarcely be diſtinguiſhed with its ſtigma: the filaments are always two, very ſhort, elaſtic, and bearing two Anthers, which you may divide like the pulp of a citron; they are encloſed in little cells opening downwards, and fixed to the inner edge of the Nectary; the fruit is a one-celled capſule, with three valves gaping at the angles. The génera of this firſt order afford flowers which, in outward appearance, ſo nearly reſemble the animal kingdom, as to have occaſioned a variety of fanciful names being given to them. The family of óphrys contains ſeveral ſpecies, which reſemble a variety of inſects, the Nectary being the principle feature in their different forms; ſometimes their flowers reſemble a gnat, a butterfly, a bee, a fly, or a bird: the Nectary of the bee-óphrys is a large thick leaf of a ſooty colour, and, when ſeen in the light, ſeems varied with three bright yellow circular lines, with ruſt coloured ſpaces between them, and ſo exactly repreſents a drone,

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EXPLANATION OF PLATE II. PART I.

OF THE DIFFERENT SHAPED COROLS AND KINDS OF SEED VESSELS.

Fig. 1. A Spathe, *a*, *a*, encloſing the Peduncles of the Flowers.
Fig. 2. The Calyx of Moſs, Calyptre, *b*, *b*.
Fig. 3. The Calyx of Fungus, *c*, called by Linneus a Volve.
Fig. 4, 5, 6. Different kinds of the Bell-form Corol.
Fig. 7. Funnel-form, *d*, the Calyx, a Perianth.
Fig. 8. A regular one-petalled Corol with a long tube, the Corol Salver-form.
Fig. 9. Back view of a Wheel-form Corol, ſhewing the very ſhort tube.
Fig. 10. Croſs-form.
Fig. 11, 12, 13. Gaping and Grinning Corols.
Fig. 14. Papilionaceous, Butterfly-form.
Fig. 15. A Capſule, with three Valves opening at top, *a*, *a*, *a*.
Fig. 16. A Capſule cut open lengthways.
Fig. 17. A Silique and Silicles, *b*, *b*, Silicles.
Fig. 18. A Legume.
Fig. 19. A Follicle, with its receptacle for Seeds, *c*.
Fig. 20. A Drupe, *d*, the Stony Seed.
Fig. 21. A Pome, *e*, the inſide Capſule.
Fig. 22. A Berry (a Grape) cut acroſs, ſhewing the Seeds.
Fig. 23. A Strobile, cut lengthways.

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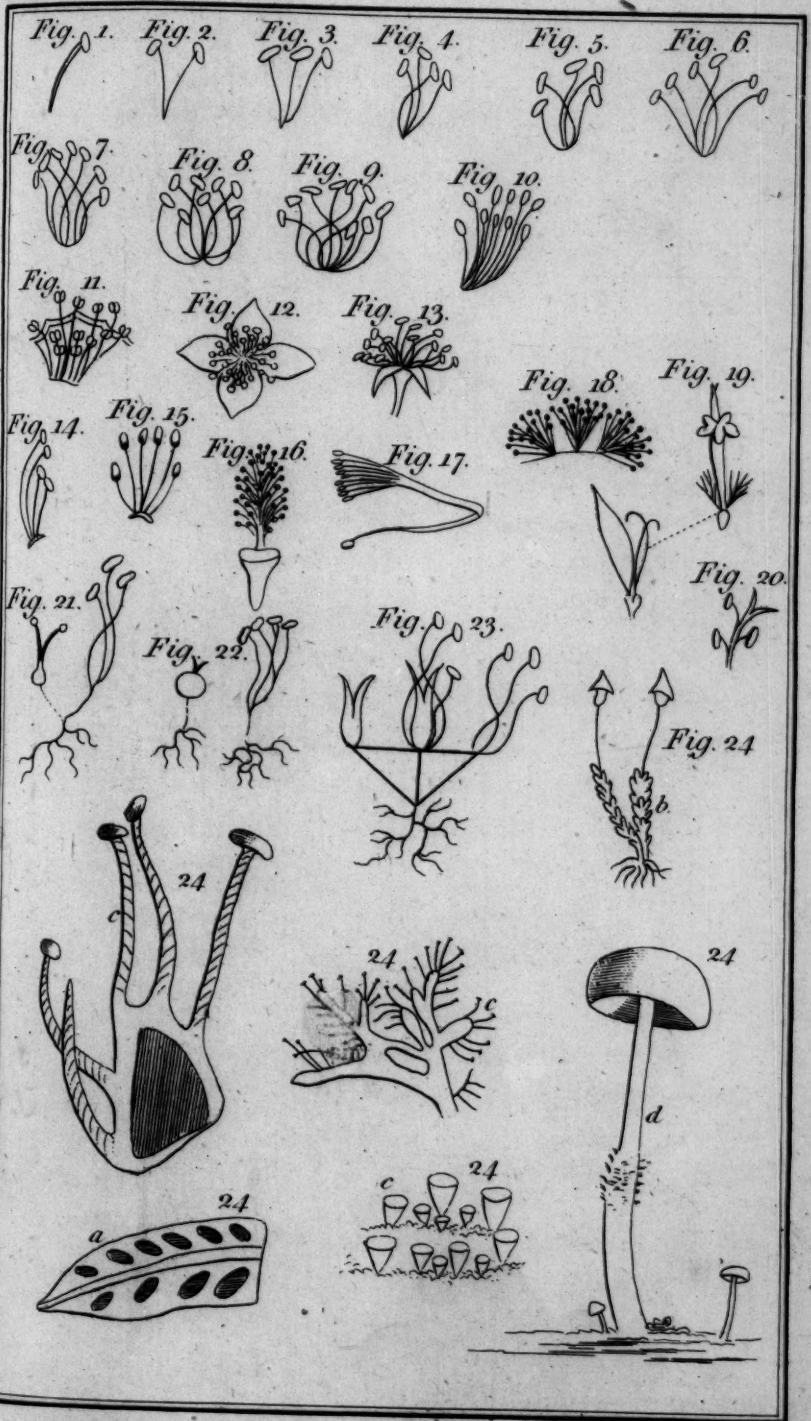
EXPLANATION OF PLATE IV. PART I.

OF THE CLASSES.

Fig. 1. One Stamen, Monandria.
Fig. 2. Two Stamens, Diandria.
Fig. 3. Three Stamens, Triandria.
Fig. 4. Four Stamens, Tetrandria.
Fig. 5. Five Stamens, Pentandria.
Fig. 6. Six Stamens, Hexandria.
Fig. 7. Seven Stamens, Heptandria.
Fig. 8. Eight Stamens, Octandria.
Fig. 9. Nine Stamens, Enneandria.
Fig. 10. Ten Stamens, Decandria.
Fig. 11. Eleven to Nineteen Stamens, Dodecandria.
Fig. 12. Not leſs than Twenty Stamens placed on the Calyx, Icoſandria.
Fig. 13. Many Stamens placed on the Receptacle, Polyandria.
Fig. 14. Two-powers, Didynamia.
Fig. 15. Four-powers, Tetradynamia.
Fig. 16. One-brotherhood, Monadelphia.
Fig. 17. Two-brotherhoods, Diadelphia.
Fig. 18. Many Brotherhoods, Polyadelphia.
Fig. 19. United Anthers, Syngeneſia.
Fig. 20. Stamens on the Piſtil, Gynandria.
Fig. 21. One-houſe, Monoecia
Fig. 22. Two-houſes, Dioecia
Fig. 23. Polygamies, Polygan
Fig. 24. Fructifications concealed, Cryptogamia. *a*, Fern, *b*, Moſs, *c*, Lichens, *c**, fringed Lichen of the natural ſize, *c*, the ſame magnified, *d*, a fungus.



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drone, or bee, that it might be miſtaken for them. This curious tribe of flowers requires very accurate inveſtigation to enable us to underſtand them; and I propoſe myſelf much pleaſure in ſtudying them with you, as my borders of the gynandria claſs come into flower.

Henry. I have often obſerved the border of orchiſes, and wiſhed to underſtand them; there is one very like a ſlipper.

Hortenſ. That is a plant belonging to the genus cypripedium, and has its name of lady's ſlipper from the reſemblance you mention. The eight remaining orders of this claſs are known by their number of ſtamens. The ſtructure of the parts of fructification in the arum is moſt extraordinary, and not to be found in any other genus. The receptacle is enlarged into a naked club, with the germs at the baſe. The ſtamens are affixed to the receptacle, amidſt the germs, which is called by Linneus a natural prodigy: the moſt eminent botaniſts have been perplexed by it. The younger Linneus was of opinion, that every Anther was to be conſidered as a diſtinct floret, and thence that the genus ought to be removed from the claſs gynándria, to

the following one monœcia, or ſtamens and piſtils ſeparate. I cannot decide on this ſubject, but hope as this opinion of the younger Linneus opens a new principle of inveſtigation, ſome ingenious botaniſt of the preſent age may be able to diſcover the ſecret of the wonderful mode of fructification found in this family: its fruit ripens about the cloſe of ſummer. You have I dare ſay often obſerved a cluſter of beautiful ſcarlet berries growing on a ſhort ſtem on the ditch banks.

Charles. Frequently; but I did not know they were the ſeed of árum: if you pleaſe, ma'am, I ſhould like to examine ſome flowers of this plant.

Hortenſ. We will do ſo. A plant, that grows commonly on our hedge-banks, we ought not to remain ignorant of; it is alſo in my botanic garden, but I could never ſatisfy myſelf about it. The following claſs monœcia, the twenty-firſt claſs, contains ſuch plants as have their ſtamens and piſtils in ſeparate covers, but growing on the ſame root, hazle (córylus), nettle (urtíca), are inſtances of the monœcia claſs, or claſs of one-houſe: the orders of this claſs are derived from

from the number, union, and ſituation of the ſtamens, circumſtances which conſtitute the chief characters in the claſſes, where the ſtamens and piſtils grow together in the ſame cover. There are eleven orders of the claſs one-houſe, which are diſtinguiſhed by the ſame names that are given to the preceding claſſes. Hazle (córylus) having ſeveral ſtamens in each ſcale of its ament, or catkin, is placed in the order polyándria, many ſtamens. Nettle (urtíca) in tetrandria, four ſtamens, and cypreſs (cupréſſus), which is alſo of this claſs, is arranged under the order monadélphia, one-brotherhood, having its ſtamens united at their baſe, like the flowers of that claſs, which might lead a young botaniſt to place it there, if he did not keep in his mind the eſſential circumſtance of the firſt twenty claſſes, viz. their having their ſtamens and piſtils in one flower: to this claſs of one-houſe belongs the nutmeg (myríſtica), the knowledge of which flower the world is indebted for to Dr. Thunberg, who has given a deſcription of the genus from the real flowers, whereas the former characters were taken from a plant, which had no affinity to the true nutmeg.

Harr. The nutmeg, I ſuppoſe, ma'am, is the kernel.

Hortenſ. You ſhould call it the ſeed; the fruit, I imagine, ſomewhat reſembles a walnut: the inner material, which ſurounds the nut or ſeed, is what we call mace, and uſe in cookery.

The Claſs Dicœcia, or two-houſes, contains thoſe flowers, which have their ſtamens growing on one plant, and their piſtils on another. Valliſnéria belongs to this claſs; the wonderful progreſs of the flowers of this plant ſeem to furniſh a ſtrong argument for the ſenſation of plants; but this is not the time to enter into the diſcuſſion of that part of our ſubject. Hemp (cánnabis), hop (húmulus), mercury (mercuriális), and willow (ſálix), all belong to the claſs two-houſes: there are fifteen orders contained in this claſs, characterized from the ſame circumſtances with thoſe of monœcia, or one-houſe, and named by words expreſſive of thoſe circumſtances. Great fault is found with the contradictions, that this occaſions, and certainly this part of the ſyſtem is open to cenſure, and in all probability would have been corrected, had Linneus's health during the latter part

part of his life permitted. Alterations have been made in theſe claſſes of late years, which I believe are pretty generally received; and as the liberal ſpirit of the age inclines his ſucceſſors in this delightful ſcience rather to render his labours perfect, than to hold out his failings to ridicule, we may hope that time will give us his ſyſtem as free from defect, as ſuch an undertaking can be expected to be.

The miſletoe (viſcum) belongs to the claſs two-houſes: this is a paraſitical plant, or one which lives upon the juices of another vegetable, without fixing its roots into the ground; it can only be propagated by ſticking the ſeeds upon the bark of trees, into which they ſtrike their roots in a curious manner. A ſeed firſt ſends out three claws, which fix themſelves on the bark of the tree, and begin to ſeparate at the centre of the ſeed, as if each claw was to become a diſtinct plant; but in a year or two the three claws become ſwoln and enlarged enough to meet at their points, and are ſo ſtrongly united, that they make the foundation but of one plant; the place of their firſt joining in the centre opens and divides, ſo that three diſ-

tinct branches appear ſpreading from the root; after this, it proceeds to bloſſom and bear fruit, and will live to a great age, agreeing very well with it's foſter tree, which it ornaments, in grateful return for the ſupport it receives; it grows moſtly on apple-trees, but is ſometimes found on the oak, though rarely, and on ſeveral other kinds of trees; the ſeeds are incloſed by ſo viſcous a pulp, that they readily adhere to other vegetables, on which they are often dropped by birds, and thus the ſpecies is propagated.

Charles. I always ſuppoſed the miſletoe grew upon oaks, we read ſo much of it being found in the Druids groves.

Hortenſ. Druids, oaks and miſletoe are ideas that we aſſemble together from infancy; but I imagine the cauſe of miſletoe being ſo much connected with the Druids, was, that in former ages it was eſteemed a powerful remedy for epileptic complaints, which were looked upon in thoſe ſuperſtitious times as viſitations of the devil, the Druids being then the great healers of the diſeaſed, held this valuable medicine in their hands, which they, in quality of prieſts and phyſicians, gathered on the firſt day of the year, with

many

many impoſing ceremonies, and diſtributed amongſt the people with much myſtery; hence the miſletoe became ſacred; but I do not recollect any proof, that it grew only upon their oaks, though it might be propagated by them upon thoſe trees. It is at this time wholly diſregarded as a medicine, ſtripped, as it now is, of the aids of ceremony and ſuperſtition; though we yet hang it up in our kitchens at Chriſtmas.

Charles. I like to ſee reſpect paid to miſletoe; I ſhall never loſe my reverence for it.

Hortenſ. Cheriſh that as much as you pleaſe.---I had intended to have gone through the claſſes this morning; but our lecture has exceeded already the time we can call our own; to continue it, we muſt infringe either upon your hours of relaxation, or upon thoſe which belong to Mr. Wilſon and Mrs. Pratt; therefore I am afraid we had better leave the two laſt claſſes, with the plants arranged by Linneus in his appendix, for our meeting tomorrow.

Harr. I am very ſorry you think ſo, mamma; but we will take our walk now, as you like to have us do ſo.

Hortenſ. If you pleaſe, my dear; and you may bring in a few flowers, which we will compare with our plates this evening; and then we ſhall be ready to begin with the remaining claſſes in the morning.

DIALOGUE THE FIFTH.

Claſs Polygamia explained.—Caprification.—Claſs Cryptogamia explained.

Hortenſ. The ſpecimens we examined laſt night of the four claſſes, you had learned in the morning, were ſo juſt, that we have no rehearſals to make now, ſo may immediately enter upon the twenty-third claſs, polygamia. The plants of this claſs muſt, on the ſame root, have flowers which contain ſtamens and piſtils within the ſame cover, and alſo other flowers, which bear either ſtamens ſeparately, or piſtils ſeparately; ſometimes flowers are found on the ſame plant, which contains ſtamens and piſtils, ſtamens without piſtils, and piſtils without ſtamens; the preſence of the firſt kind marks the claſs; without flowers, which contained both ſtamens and piſtils, the plant would belong to either the claſs one-houſe, or two-houſes. The plants of the polygamia claſs are many of them diſperſed by the preſent botanic writers into monœcia and dicœcia; ſo that probably that claſs will ſoon be baniſhed from the ſyſtem. The orders, of which there are three, depend on

the diſpoſition of the ſtamens and piſtils in the flowers of the different plants. The fig (ficus carica) long perplexed the botanic world, to diſcover by what mode the duſt of the ſtamens could be conveyed to the piſtil, as theſe parts of fructification are incloſed within ſeparate fruit, this fruit not being a ſeed-veſſel, but a receptacle ſurrounding the ſtamens and piſtils, which grow upon it; ſome of them being ſo cloſely immured, that the manner in which they are fertilized was incomprehenſible. At length it was diſcovered, that a kind of gnat depoſited its eggs in theſe receptacles, and, by going from one kind of fig to the other, was ſuppoſed to bear on its wings the anther duſt of the ſtamen-bearing fig, to the ſtigmas of that which bore only piſtils. This proceſs performed by the gnat was called caprification, and was ſo ſtrongly believed to be eſſential to the ripening of the cultivated fig, that the inhabitants of the Archipelago, who trade with their figs, ſpent much time in obſerving the critical moment of the gnat iſſuing out of one kind of fig and entering the other, and ſometimes gathered the fruit, in which the gnat was contained,

and

and brought it to that, which they wiſhed to have fertilized. Mr. Milne gives a long and curious account of the proceſs of caprification; but I cannot aſſent to the truth of the neceſſity of it, there appear to me ſo many objections againſt it. Firſt, there is not any ſpecies of fig known, which bears piſtils only; conſequently not any which is not ſufficient in itſelf to its own fertilization. In Provence and Spain the cultivated fig is proved to be ſo by being brought to perfection without the proceſs of caprification. Secondly, theſe fruits generally open at the top, at the time that their ſtamens become mature; a circumſtance analogous to all water plants, which riſe to the ſurface, when their ſtamens are ready to ſcatter their duſt, in order that they may diſperſe it in the open air; an element which ſeems neceſſary for that proceſs. But I fear tiring you on this intricate ſubject, as we cannot examine the inſect or its effects in this climate with our own eyes.

Charles. I ſhall not be tired; I am intereſted on the ſubject of caprification. Mr. Wilſon read an account of it to me yeſterday, and ſaid it was a ſtrong argument for Linneus's

neus's ſyſtem of the anther duſt being neceſſary to the fertilization of the ſeed.

Hortenſ. So it has been conſidered, and made uſe of as ſuch by many intelligent authors. Indeed I do not know any who have doubted of it, till the celebrated author of the Botanic Garden, whoſe inveſtigations have thrown light upon many obſcure ſubjects in botany, conjectured that thoſe figs, which have their receptacles cloſed on all ſides, might be vegetable monſters cultivated for their fruit, as thoſe grapes and barberries are, which are without ſeed; and that the proceſs of caprification might be of imaginary uſe, or that it might contribute to ripen the fruit, as thoſe apples ripen ſooner which are wounded and penetrated by worms in our own climate; and this ſeems probable from what is told us by Mr. Milne concerning the figs of Malta; one kind of which, he relates from Tournefort, bears two crops in the ſame year, the figs of the firſt being ſweet, and arriving at perfect maturity *without* the aſſiſtance of caprification; thoſe of the ſecond being much ſmaller, and not ripening at all, if this proceſs be not followed. Tournefort adds, that the figs in Provence and in Paris ripen

ripen ſooner if they are pricked with a ſtraw dipped in oil, which ſeems to make it probable that the puncture of inſects in caprification may cauſe the ſecond crop of fruit to arrive earlier at maturity in Malta; that is, before the inclement part of the ſeaſon comes on; as in our climate the plumbs and pears wounded by inſects frequently ripen ſome weeks ſooner than the others, to which that circumſtance has not occurred. The fig-trees cultivated in our own country produce two crops; the firſt upon ſhoots of a year's growth, which appears in ſpring, and arrives at maturity in the courſe of the ſummer; the laſt crop does not put forth till autumn, and proceeds from the ſhoots of the preceding ſummer. This crop can never ripen in our climate, and is carefully pulled off by the gardeners. It would ſeem that the tree has not power to bring two crops to perfection, even under the influence of more benignant ſkies, as at Malta, as the fruit obtained by the proceſs of caprification is ſcanty and of bad quality.

Charles. Mr. Wilſon will not like to have me doubt of the truth of caprification; but I now ſee the force of your objections, ma'am, and

and wonder I did not find them out myſelf.

Hortenſ. We will talk with Mr. Wilſon on the ſubject; he may perhaps ſhew us that our objections are not ſufficient to overturn an opinion ſo long and ſo generally received. Where we find that men of acknowledged abilities have been miſtaken, it will become us to heſitate. The neceſſity of caprification has obtained a general belief in the Eaſt; but in this enquiring age, we cannot aſſent to facts, to which we think both reaſon and analogy oppoſed. We ought, however, to controvert them with great modeſty. We will now releaſe Henry and Juliette from this long diſſertation. You too, Harriet, I fear are tired.

Harr. No indeed, ma'am; I do not pretend to have been particularly amuſed; but I have been informed.

Henry. I have often wondered, that I did not ſee flowers on the fig-trees.

Hortenſ. Remember that you muſt look for the flowers within the fruit. If you cut a fig open at the time, when it gapes at the top, you will ſee the florets arranged on the inſide in a beautiful manner, and you may find

find ſeveral of the ſtamen-bearing kind in the ſtate of diſperſing their duſt.

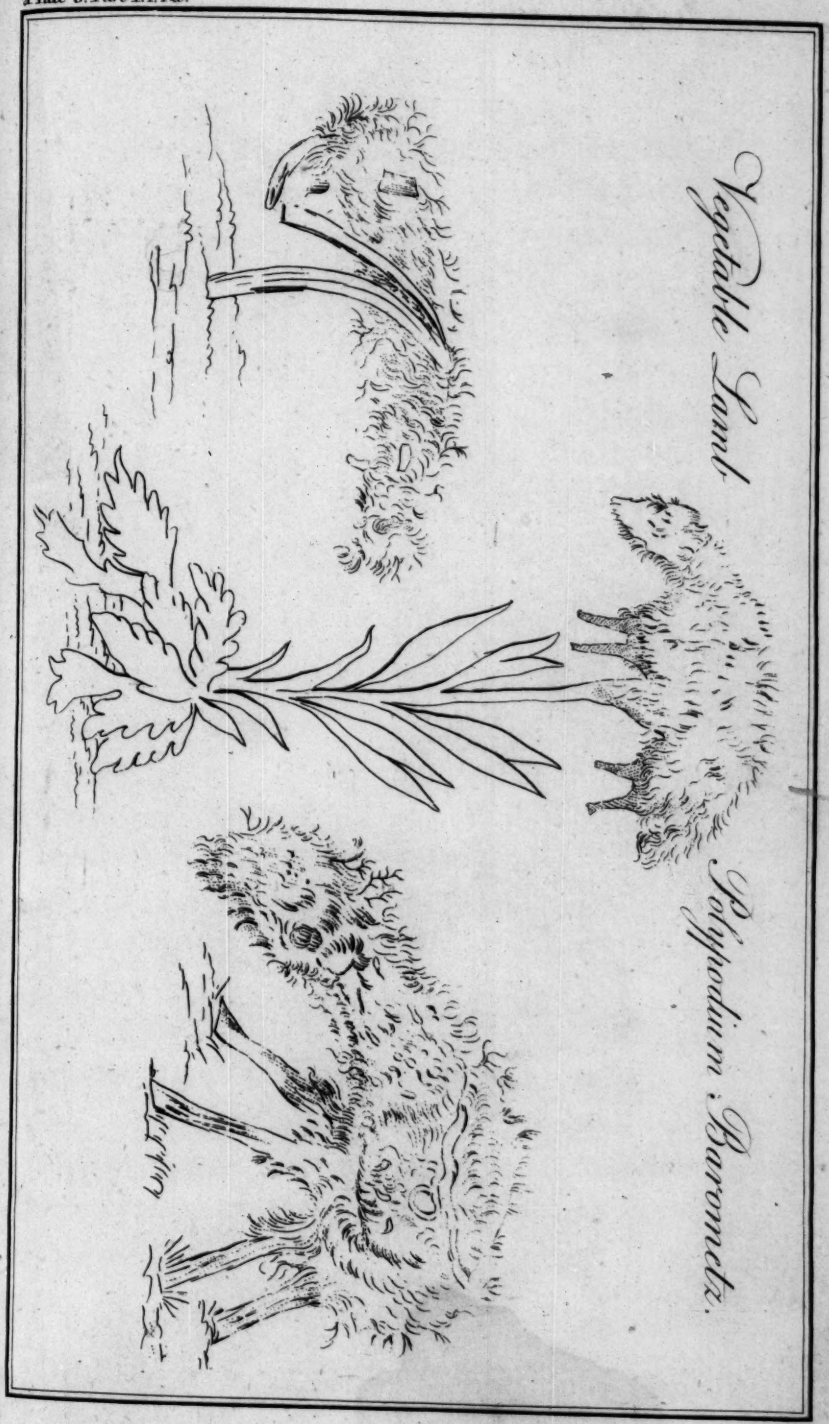
We will now begin with the laſt claſs, cryptogamia, which conſiſts of ſuch plants as have their fructification ſo obſcure, that there are but few genera, in which it has yet been diſtinctly ſeen. This claſs includes all thoſe plants, which have a ſtructure different from thoſe comprized in the other three and twenty claſſes, and is divided by Linneus into four orders, the filices, ferns; muſci, moſſes; algæ, wrack, or ſea-weed; fungi, funguſes. The little knowledge, that has hitherto been obtained of theſe numerous tribes of plants, has been conſidered a great reproach to the ſcience of botany. Perhaps the ſyſtem of Linneus may have retarded a more diſtinct arrangement of them, that being founded upon the parts of fructification, which in moſt of the génera belonging to the claſs cryptogamia, are ſo difficult to aſcertain. The ferns are defined to be plants bearing their flowers and fruit on the back of the leaf or ſtalk, which in this tribe of plants are the ſame, the ſtem not being diſtinguiſhable from the common foot-ſtalk, or rather mid-rib of the leaf: ſo that in ſtrict propriety the ferns may be ſaid

to

to be without ſtems. The ſtem and leaf thus united are termed by Linneus a frond. The ſeed of the ferns affords an inſtance of the moſt curious mechaniſm, and will be well worthy of our attention, when we are become profeſſed botaniſts; at preſent I ſhall only give you an outline of the characters of the genera contained in the claſs cryptogamia, and, by ſhewing you ſome of them with plates, enable you to form a clear idea of their extraordinary ſtructure. The true ſago powder is ſaid to be made from the pith of a ſpecies of fern, *Cycas circinalis*; and that great vegetable curioſity, the tartarian lamb, is now known to be the root of the polypodium barometz, which, being puſhed out of the ground in its horizontal ſituation by ſome of the inferior branches of the root, bears ſome reſemblance to a lamb ſtanding on four legs, which is increaſed by the thick yellow down, by which its root is covered. It is ſaid to deſtroy all other plants in its vicinity. We will look at a print of it.

Charles. I have heard wonderful ſtories of this vegetable lamb, and believed it to be ſome extraordinary monſter.

Hortenſ.



Vegetable Land Polypodium Baromets.

London Published May 1. 1797. by J. Johnson St. Pauls Church Yard.

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Hortenſ. Many things have gained the character of monſters from want of being inveſtigated. In former ages, travellers might have given a grave account of a tree, bearing gloves and ſtockings and caps, growing in Caffraria; the report of which was ſo general as to excite the attention of Dr. Thunberg, when travelling in that country. With his uſual aſſiduity he unveiled this myſtery, and found all this wearing apparel to be nothing more than the downy leaves of the Bupléurum giganteum, which by a little dextrous management were converted into thoſe various articles, which were aſſerted to grow upon the plant. Hence you ſee the confuſion, that ariſes from being too ready to believe or to relate, what we hear.

Harr. I ſhould have thought the inhabitants of the place muſt have been well informed.

Hortenſ. So might Dr. Thunberg, had he not been accuſtomed to reaſon upon facts related to him, before he aſſented to the authenticity of them. Do any of you recollect the uſe that was made of a ſpecies of fern in New Zealand?

Henry. Captain Cook ſays, the people uſe the root of common fern for bread. Pray what is it's botanical name?

Hortenſ. Pteris aquilina. Bread is alſo made from a ſpecies of fern by the inhabitants of Palma, one of the Canary iſles, when corn is ſcarce, and is ſaid to be little inferior to that made from wheat.---But we muſt now begin with the ſecond order of cryptogamia. The moſſes, (muſci), are divided according to their anthers, being calyptred, or not calyptred, being on the ſame, or ſeparate plants, and having the piſtil florets ſolitary, or growing in cones. Their ſeeds have no cotyledons, or any proper coverings. Linneus doubts, whether what he has called anthers might not with greater propriety take the name of capſules, and their duſt be conſidered as true ſeeds, as in Buxbaúmia, and ſome other génera, have been ſeen within the covers real duſt-bearing anthers depending from their filaments, gaping at the top to diſcharge their duſt on the fringes, as on piſtils. Dillenius, profeſſor of botany at Oxford, was the firſt, who attempted an arrangement of the moſſes. There are many curious circumſtances belonging to the tribe of moſſes, which ſometime

time we will fully enter into. One I will now mention to you, which is their having this ſingular property, that though preſerved dry for ſeveral years, upon being moiſtened they reſume their original verdure, and probably their power of vegetation; but I do not recollect whether this has ever been tried. The fructification of the flags, or algæ, is ſo obſcure as not to admit of preciſe arrangement; they are only divided into terreſtial and aquatic, and the génera diſtinguiſhed by their outer ſtructure. This order contains many curious and uſeful vegetables; among the latter there is none more worthy of notice than the lichen rangiferinus. This little plant may be properly eſteemed the ſupport of millions of mankind, as it is the ſole food of the rein-deer; without which ſerviceable animal, the inhabitants of the northern regions could not exiſt. The rein-deer furniſhes them with milk, butter and cheeſe, draws them in ſledges with eaſe and ſwiftneſs over vaſt tracts of land buried in ſnow; his fleſh affords them food; his ſkin, cloathing; his tendons, bow-ſtrings; and his bones, ſpoons. All theſe benefits would be loſt, had not nature formed this lichen ſo as to enable it to

vegetate beneath the ſnow, by which it is commonly covered to a great depth; the rein-deer however contrive to dig through it with their feet and brow-antlers, till they arrive at their food. The common name of rein-deer lichen, by which this plant is known, it has therefore the fulleſt claim to.

Harr. It is very agreeable to know ſuch particulars; they make the ſtudy of vegetables very intereſting.

Hortenſ. In the general ſtudy of nature, we cannot too much bear in our minds the advantage derived by one individual of the ſame common ſtock from another. The contemplation of this general law of nature ſtrongly points out to us, that we are not placed here to be idle and uſeleſs ſpectators of the tranſactions of our fellow-creatures, but that it is our duty to contribute, as much as we have the power, to the general benefit of all. The lichens ſtill further contribute to this general benefit, different ſpecies of them being uſed in dying reds and purples. Dr. Thunberg relates, that the Japaneſe gather a ſpecies of ulva, which is one of the algæ, and, clearing it from all impurities, dry and reduce it to a fine powder, which they eat with boiled rice,

rice, and ſometimes put into ſoup. There are other ſpecies alſo of them, which are uſed for food or pickles by ourſelves. The formation of ſome of the génera, which belong to the aquatic diviſion of this order, is worthy of remark. The conférva ægagrópila is of a globular form, from the ſize of a walnut to that of a melon, much reſembling the balls of hair found in the ſtomachs of cows. It does not adhere to any thing, but rolls from one part of the lake, on which it lives, to another. The conférva vagabunda has its name from it's wandering habits. It dwells on the european ſeas, travelling along in the midſt of the waves. Theſe may not improperly be called itinerant vegetables. In the ſame manner, the fucus natans ſtrikes no roots into the earth, but floats on the ſea in extenſive maſſes, and may be ſaid to be a plant of paſſage, as it is wafted by the winds from one ſhore to another. The byſſus flos-aquæ, water flower, floats on the ſea all day, and ſinks a little during the night, as if to protect itſelf from the injuries of nocturnal air, or poſſibly this may be its mode of ſleeping or taking reſt.

Charles. Pray, ma'am, is it not a ſpecies of conférva, that you ſhewed me the playful

lines about in the Botanic Garden, and which make that pretty picture of the Lady bridling the Pard?

Hortenſ. It is the Conférva Polymórpha, whoſe extraordinary changes of appearance gave riſe to the lines, you allude to. This plant twice changes it's colour from red to brown, and then to black, and varies it's form, by loſing it's lower leaves, and lengthening ſome of it's upper ones, ſo as to be miſtaken by unſkilful botaniſts for different plants: it grows on the ſhores of this country. The laſt order of the claſs Cryptogamia, conſiſts of the Funguſes, or Fungi. Linneus has divided this order of plants according to the method of Dillenius; indeed he does not ſeem himſelf to have attended to any of the orders of this obſcure claſs, with that indefatigable reſearch, which characterizes his labours in regard to the other part of the vegetable kingdom; but, with a candour belonging to true knowledge, he frankly owns himſelf indebted to Dillenius, and Micheli, for the information he is able to give the world reſpecting them. The method of Dillenius, which Linneus has followed, is founded upon the figure of the Stipe, or Foot-ſtalk;

the

the hat, or upper part, with its plates, holes, and cavities, and from the variety of ſtructure in theſe parts, has divided the whole Fungus tribe into ten Génera. The ſudden appearance of theſe kinds of plants, in places where they had not been known before, gave riſe to the belief, that they had their origin from putrefaction; but this has been clearly proved to be a miſtake, and that they are produced from ſeeds; that their ſpecies are conſtant, and renewed by uniform laws; notwithſtanding it muſt be confeſſed, that we are yet much in the dark, concerning this part of the vegetable creation; but, as it is now particularly attended to, a few years may probably make us acquainted with the various modes of its re-production. We already owe much to the accurate inveſtigations of Mr. Curtis, and to other able botaniſts of the preſent age, who have elucidated the knowledge of theſe plants by many beautiful drawings. Now you are become botaniſts, I will make you a preſent of * Mr. Sowerby's Engliſh Botany,

* Sowerby's Engliſh Botany, publiſhed monthly in numbers, containing ſix coloured plates, each number price 2s. 6d.

which will aſſiſt you greatly in the knowledge of the moſt rare Engliſh plants, as good coloured plates are given of them, and agreeable accounts of their habits, and whatever peculiarities belong to them; in the Cryptogamia claſs particularly you will find the uſe of this publication, as by ſtudying the pictures of various plants belonging to that claſs, which in theſe numbers are elegantly repreſented, you will feel an intereſt in the originals, and be led to ſearch into their hiſtories, in which no doubt we have much curious matter to diſcover; the late diſcoveries of the wonderful manner, by which various ſpecies of the animal world are continued, may poſſibly lead to ſome equally extraordinary regarding vegetables. The hiſtories of the Polypi or Hydræ aſtoniſh us, particularly of the Hydra Stentorea, which multiplies by ſplitting lengthways; in twenty-four hours theſe diviſions, which adhere to a common pedicle, re-ſplit, and form four diſtinct animals; theſe four in an equal time again ſplit alſo, and thus proceed, doubling their numbers daily, till they acquire a figure ſomewhat reſembling a noſegay; the young afterwards ſeparate from the parent ſtock, attach themſelves to the roots or leaves

of

of aquatic plants, and each individual gives riſe to a new colony. The freſh water Polypus you may cut into innumerable diviſions, and every ſeparate piece will become a ſeparate animal.

Henry. That is like the fable of Hydra's heads.

Hortenſ. I am no longer inclined to think that hiſtory fabulous; at leaſt we have facts from the experiments of Monſieur Trembley in regard to the freſh water Polypus, or Hydra, being ſo named I imagine from the fable, which equal any ideas, that could occur to the imagination of the moſt romanic fabuliſt. Such inſtances of propagation in animals have led me to the ſuſpicion, that ſimilar modes may poſſibly be found to take place in ſome of the tribes of vegetables belonging to Cryptogamia; I mean excluſive of all others; for the increaſe of plants from ſuckers and ſtrings, may be conſidered analogous to the re-production of the Hydra genus; but ſuch analogies it is not our buſineſs to enquire into at preſent.

Juliette. You always quit the ſubject, mamma, when you have excited our curioſity.

Hortenſ.

Hortenſ. I do not mean to tantalize you; but if we do not proceed with regularity, we ſhall not be able to arrange our ideas. The information is ſo ſmall, that I can give you of the claſs Cryptogamia, that I fear miſleading you, if I fix your attention on the ſuppoſed parts of fructification of the plants contained in it; however, what I have ſaid of the poſſibility of their increaſe, by modes ſimilar to that of the curious animals I have mentioned, is mere conjecture; but on ſo obſcure a ſubject light may be thrown from experiments founded on analogy. It is certain, that little progreſs has been made in the knowledge of theſe extraordinary plants by thoſe, which have proceeded upon the expectation of diſcovering the parts of fructification. The uncommon beauty of an aſſemblage of theſe plants on our banks walls and heaths in winter muſt engage the attention of botaniſts; and we will hope from our united endeavours, that fame is reſerved for ſome of us on this ſubject.

Charles. I fear the attainment of that fame is a great way off: however, we will try for it, and begin by collecting all the different kinds of ferns, moſſes, flags and funguſes, we

can

can find; but we ſhall not be able to preſerve the funguſes.

Hortenſ. That has been ever a great impediment to an accurate inveſtigation of them. A method of preſerving them has lately been delivered to the Linnean Society, which, ſhould it prove effectual, will be a means of enabling you to attain a more convenient opportunity of inveſtigating them, than has yet been acquired; but you muſt arrange, before you pretend to diſcover, the plates of Mr. Bolton with his hiſtory of Funguſes; and the elegant drawings of other ingenious botaniſts will aſſiſt you in this undertaking; but it is to be lamented, that ſuch uſeful works as we ſee frequently appear on this ſubject, cannot be afforded at a cheaper rate. Mr. Bolton's * works are much too expenſive to be in many hands; and even Sowerby's Engliſh Botany would be more generally bought, was it publiſhed at as low a rate as Mr. Curtis's magazine: it ought to be a point with every one, who publiſhes on any ſcience, to make their work as eaſy of acceſs as poſſible.

* Mr. Bolton's Hiſtory of Funguſes, growing about Halifax, in four volumes, each vol. 2l. 2s. coloured; 18s. plain.

Harr.

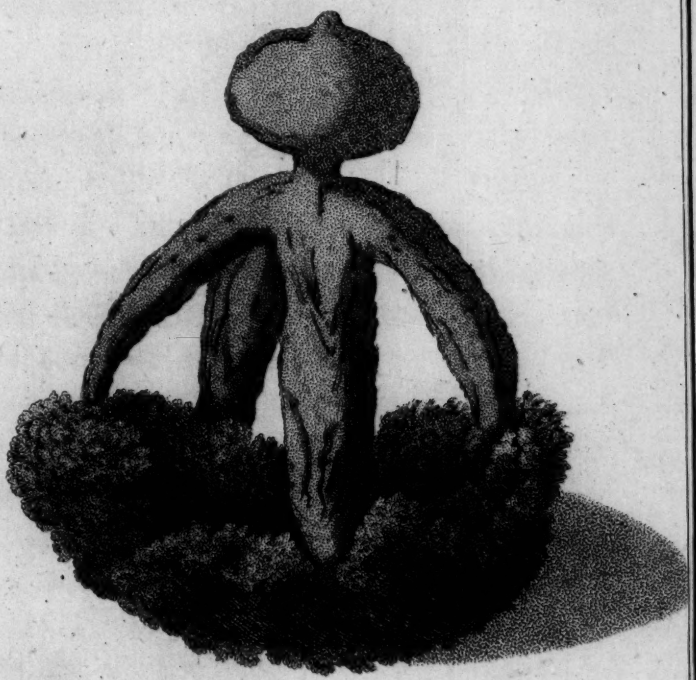
Harr. I recollect that you told us, Ma'am, that the ſtar-jelly was not a vegetable, but a ſubſtance, that herons parted with, after they had eaten frogs.

Hortenſ. If you recollect all the information, you received on that ſubject, pray relate it to Juliette and Henry.

Harr. I never forget, what I read in the Botanic Garden. The frozen ſtatue of the fair Tremella was in reality this ſtar-jelly, which, becoming tranſparent after it has been frozen in autumnal mornings, is diſtinguiſhed by this property from other vegetable mucilage. The paſte that we uſe in our works, is no longer of ſervice after being frozen, as it does not adhere; but poor Tremella could no longer move, after ſhe had been congealed; therefore we may conclude that ſhe was not of vegetable origin. May not Juliette and Henry read thoſe lines, mamma?

Hortenſ. They may read them this evening. There is a ſpecies of fungus, the Lycopérgon fornicatum, or Turret puff-ball, which is of a very extraordinary form, having the appearance of an inverted muſhroom; it is well deſcribed by old Gerrard, who ſays, "It hath a ſmall ſtringy root, differing from all others,

Lycoperdon Fornicatum.



Found growing in Mr. Rooke's Kitchen Garden, near Mansfield Woodhouse, September 1792.

London. Published May 1.1797. by J. Johnson. St. Paul's Church Yard.

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others, and a round white fungus at firſt, which afterwards breaking open, divers reddiſh branches do ariſe out thereof, which do all join together, making round arches of hollow netted bars or lattices, as it were ſeparated one from another."—I will ſhew you his plate of it, and alſo one from the plant itſelf, which was found growing in Mr. Rooke's kitchen garden, near Mansfield. Gerrard calls it Fungus Coralloides.

Henry. We ſhould be a great while of learning botany, mamma, if you were to teach us in the language of old Gerrard.

Hortenſ. He is certainly very prolix; but his deſcriptions are expreſſive: ſuch prolixity we do not meet with in theſe days; but we are often confounded by the profuſion of characteriſtic circumſtances, which are crowded into a géneric deſcription. One line of the ſyſtem of vegetables will be frequently found to mark a plant as decidedly as a whole page of ſome other books. The expreſſive conciſeneſs of Linneus is yet unrivalled.—But we are amuſing ourſelves, rather than learning.—It is time to think of the appendix, which is adjoined to the Claſſes. This conſiſts of plants, which Linneus rather choſe to place apart, than

than to diſtribute them into the ſeveral claſſes of his ſyſtem, and this on account of their ſingular ſtructure; he has arranged them all under the head of Palms, and defines them to be plants with ſimple ſtems bearing at their ſummit leaves reſembling thoſe of ferns, which you remember are called Fronds, and are a compoſition of a leaf and a branch. Their flowers and fruit are produced on that particular kind of receptacle called a ſpadix, protruded from a common calyx in form of a ſheath, termed by Linneus a ſpathe. The terms ſpathe and ſpadix were originally applied to palms only, but are now uſed with much greater latitude, and applied to the narcíſſus, árum, and many other plants, whoſe flowers come out of a ſheath; the cocoa-nut-tree (cócos nucifera) is a palm, ſo is the date-tree (phœnix dactylifera); and it is aſſerted by ſome authors, that if the ſtamen-bearing flowers of this plant are gathered in a proper ſtate of maturity, and dried, the duſt of the anthers will retain its virtues for more than a year; the ſame alſo is ſaid of the Piſtacia, which belongs to the claſs two-houſes (Dioecia) the corypha umbraculiferæ belongs to this majeſtic order of vegetables being often

200 feet in height; it is a native of the Weſt Indies, and has obtained the name of umbrella-bearing, from the ſhelter which it's large feathered leaves afford to the inhabitants of that ſcorching climate from the ardent rays of the ſun. This tree has alſo been called the cabbage-tree, but erroneouſly: Mr. Forſter informs us, that the true cabbage palm is a ſpecies of aréca, the aréca oleracea, ſo called I imagine from the uſe that is made of the kernel-like ſubſtance, which is found towards the top, and which is a moſt grateful and ſalutary food to ſailors, who have been long confined to ſalt diet; on which account, this ſubſtance has been celebrated by all navigators, and from them has obtained the name of cabbage, from its reſemblance in taſte to that vegetable.

Charles. I have read an account of the cabbage-tree, wherein it is ſaid, that the part called cabbage is commonly uſed as food in the Weſt Indies, though at the ſame time it is obſerved, that the tree is deſtroyed by being deprived of it. This I did not underſtand, as I think we have not any tree, that would be killed by having it's top cut off.

Hortenſia.

Hortenſia. I believe it to be an error, that this cabbage is generally made uſe of in the Weſt Indies; I am well informed, that it is eſteemed there only as a rarity, and ſometimes ſent as ſuch, when pickled, to England; and ſo far is it from being plentiful, that it is ſeldom obtained, except when by thinning the woods, or from ſome other cogent reaſon, it is neceſſary, that the tree muſt be cut down: it is a fact, that the part called cabbage, cannot be procured but by the deſtruction of the whole tree; and if we conſider it's manner of growth, we ſhall not be at a loſs for the cauſe of this; the whole tribe of palms bear their leaves on the upper part of their ſtems only; ſome of which riſe to the height of 200 feet; the part eaten as cabbage I believe to be the yearly ſhoot; by cutting off which the leaves, which ſhould form the buds for the enſuing year, are deſtroyed, and with them the life of the plant: if you ſtrip the leaves from any common tree, ſo as to prevent the formation of buds, you will either entirely kill it, or at leaſt ſo far deſtroy it's vigour, as to render it of no value. This is an agreeable branch of the ſtudy of botany; but we are not yet ready to enter upon it.

Harr.

Harr. Pray, Ma'am, is the aréca the only palm, that bears the ſhoot called cabbage?

Hortenſ. The cocoa-nut palm, and ſeveral others, are ſaid to afford it; but the aréca oleracea is the only one, that has it in perfection; but the accounts we have of theſe trees are ſo ſhort, and often confuſed, that I am not able to inform you reſpecting them, as accurately as I wiſh to do. The hiſtory of the vegetation of warm climates by a philoſophical botaniſt would be a work of the firſt value.

Juliette. Pray, mamma, what tree is the bread-fruit tree?

Hortenſ. It is the artocárpus communis of Forſter, and belongs to the claſs monoecia, one houſe. The various attempts, which have been made to introduce this valuable tree into the Weſt India Iſlands, promiſe at length to be ſucceſsful. There are now plantations of it in Jamaica, from which fruit has been gathered. Nearly twenty years ago Dr. Thunberg exerted his beſt endeavours to bring it into Europe; but at the time, when he flattered himſelf that he was on the eve of depoſiting his treaſure with ſafety, all his hopes were fruſtrated by a violent ſtorm, which endangered the loſs of

the veſſel, on board which he was with his valuable cargo of more than an hundred bread-fruit trees, and other rare plants, all of which were deſtroyed. Theſe trees he had brought from the iſland of Ceylon; the luxurious inhabitants of which place do not confine themſelves to the uſe of the fruit in the plain manner, in which it is eaten by the more ſimple natives of Otaheitee (who, for food, bake it amongſt hot ſtones, and for liquor, mix it with water.) The Cingaleſe have a variety of high diſhes made of it. Dr. Thunberg enumerates fifteen different ways, in which they have it prepared; but what gives this celebrated tree its real importance is the extenſive benefit, which is derived from it to the poor, who make uſe of its fruit to ſupply the place of bread or rice, or as our poor do of potatoes, whence its name of bread-fruit. There are two kinds found in Ceylon; one which yields ſmaller fruit, has no ſeeds, and is more rare; the other, bearing fruit from thirty to forty pounds weight, grows in all parts of the iſland, and produces ſeeds to the number of two or three hundred, each of which is four times the ſize of an almond.

Charles. Then I ſuppoſe it is the firſt kind, that they have in the iſlands of the South-Sea; as I recollect Mr. Forſter ſays, that the ſeeds of the fruit found in thoſe iſlands are ſhrivelled up, and loſt in the pulp.

Hortenſ. Mr. Forſter tells us, that the bread-fruit tree of the South-Sea iſles has four or five varieties, all without ſeed; which deficiency he attributes to the effects of cultivation; but as Dr. Thunberg, contrary to his uſual accuracy, omits giving the botanical names of the bread-fruit tree of Ceylon, I cannot aſcertain to you in what particulars it differs from, or agrees with, thoſe of the Pacific Ocean; but I ſuppoſe them certainly to be of the ſame genus. If they are deprived of their ſeeds by cultivation, they loſe a part, which in Ceylon is much eſteemed as a nutritious and palatable diet. They are prepared by the rich in different ways; fried in cocoa-nut oil, they are eſteemed a great delicacy; by the poor they are eaten roaſted like cheſtnuts, alone, or mixed with the pulpy part of the fruit, which they frequently eat ſimply boiled or roaſted, or ſometimes mixed with a little rice, raſpings of cocoa-nut, onion, and a ſmall quantity of ſalt and turmeric. The

bread-fruit trees flouriſh for whole centuries, and bear their fruit, which ripens by degrees, not only upon the thickeſt branches, but upon the ſtem itſelf, for the ſpace of eight months together. The fruit is uſed for food in three different ſtates of ripeneſs, but cannot be eaten without preparation, till it arrives at maturity; at which time the pulp, which ſurrounds the ſeeds, has a ſweetiſh taſte, and is often eaten in its freſh ſtate, after peeling off the rind, which is thick, and covered with prickles.

Henry. Pray, Ma'am, is not there another tree called the bread-tree?

Hortenſ. The banana and plantain tree, muſa ſapientum, and paradiſiaca, have obtained the name of bread-trees from the ſame cauſe that the artocárpus has been ſo called; many hundred acres of them being cultivated in Jamaica for the uſe of the negroes, who are ſaid to prefer the fruit of the plantain tree, when roaſted, to bread, and that moſt of the native whites uſe it in the ſame manner. The banana is alſo found in the South-Sea iſles and is ſaid by Mr. Forſter to loſe its ſeeds by cultivation, as the artocarpus does; but it is not food only, that theſe trees ſupply

to the inhabitants of the warm climates: the banana adminiſters to their wants by the ſhade of its leaves, the ſize of which is often eight feet long, and three feet broad; it is moſt intereſting to read the accounts given of the vegetables in thoſe luxuriant regions, which theſe trees among others of equal or more extenſive uſe inhabit. The cocoa-nut tree ſeems to merit a place in the firſt rank; and Dr. Thunberg tells us of two ſpecies of palm-tree in Ceylon, the boraſſus flabelliformis, and Licuála ſpinoſa, whoſe leaves are uſed without any further preparation than ſeparating and cutting them, even for writing upon; the method of which is to carve with a fine pointed ſtyle the letters upon the leaf, and then rub them over with a fine charcoal, which gives them the appearance of having been engraved: thus they write all public edicts and letters, and form books by ſtringing ſeveral ſlips of theſe leaves together, and ornament them by figures engraved in the ſame manner as the letters: one of theſe books Dr. Thunberg brought with him to Europe. The leaves of the licuála palm are uſed for umbrellas; one ſingle leaf is ſaid to be ſufficient to ſhelter ſix perſons from the ſun or rain; but it would take too much of our time at

preſent, were I to enumerate to you the various ways, in which the vegetable kingdom, from the majeſtic palm to the humble graſſes, leaves and roots, woven into mats and baſkets with peculiar ingenuity by the negroes on the coaſt of Africa, has been made ſubſervient to the wants of mankind; ſince by our knowledge of fire and tools we have gained dominion over it.

Henry. How is that?

Hortenſ. You may judge of the ſtate of mankind before the important diſcovery of fire from the wants of thoſe nations who are yet wholly ignorant of it's powers. You may learn from the voyages to the South Sea, how little acquainted even the cultivated inhabitants of Otaheitee were with it's properties, when one of the principal of them catched a ſtream of boiling water in his hand, not conceiving it could become hot, like red fire. The knowledge of fire enabled mankind to furniſh themſelves with tools of iron, by which they have been enabled to conquer foreſts of immeaſurable extent, while in countries, whoſe inhabitants are yet ignorant of the uſe of ſuch inſtruments, or but partially enjoy the benefit of them, theſe foreſts continue

tinue almoſt to exclude the growth of other vegetables, and to deny the uſe of the ſoil to man. Beſides this, we make uſe of fire to render a variety of vegetables wholeſome and agreeable food; ſome of which in their natural ſtate are either noxious, or difficult of digeſtion, without fire; for inſtance, you could not eat potatoes, cabbages, or kidney-beans.

Charles. Mr. Wilſon often calls my attention from the highly civilized ſtate, in which I am placed, to that of man in the woods. Some writers, I think, Ma'am, prefer the latter to the former.

Hortenſ. There are ſome, who affect to do ſo, and who declaim upon the ſuperior virtues of man in an uncivilized ſtate. Were we to purſue their principle to the fartheſt, it is ſolitary man, whom we muſt extol; for he no ſooner enters into ſociety, be it ever ſo ſmall, than he begins to be civilized, and to loſe that virtue, ſo much praiſed, by the power he gains of committing vice; for the ſavage, pilfering betel-root, as much tranſgreſſes the laws of his ſociety, as a thief, who breaks a houſe, infringes thoſe of our's. The faculties we poſſeſs are ſurely meant to be employed; the more we cultivate them, the

more we gain the power of benefiting the whole creation ; but if we mis-uſe that power, we ſink ourſelves beneath the virtue of the poor ſavage, whoſe life is divided between the care of procuring, and the pleaſure of conſuming his food. But if we exert it to the advantage of the ſociety we live in, we ſhall not feel ourſelves inclined to envy the ſluggiſh ſtate, in which even the moſt civilized inhabitants of but partially cultivated countries are found.

Charles. Mr. Wilſon has never ſo little patience, as when we read authors, who extol the life of ſavages above our's.

Hortenſ. We muſt diſtinguiſh betwixt what is really ſavage, and that which Europeans proudly call ſo, becauſe it differs from our own. We will read that ſenſible and humorous eſſay of Dr. Franklin's on this ſubject, wherein he pointedly ſatirizes this general contempt of the various Indian nations, who we have ſtigmatized with the name of ſavages. Where we find a regular ſociety, bound by the ſame laws, and united together by one common intereſt, we are not to call that ſtate ſavage, becauſe it's modes and cuſtoms do not agree with our's. Without laws,

laws, mankind are little ſuperior to the brutes; it is their united ſtrength, and their united wiſdom, which makes them numerous and powerful. An eminent philoſophic writer of the preſent age has remarked, that it is the ſuperior portion of voluntary power poſſeſſed by mankind over brutes, and the greater energy and activity of the exertion of that power, which is one of the moſt diſtinguiſhing marks between them: hence the more we exert that power, the more we raiſe ourſelves above the brute creation.---But Henry's queſtion has led us far away from our ſubject; and we ſhall have need of the exertion of our voluntary powers to get back to it.

Harr. It will be a force upon my voluntary power to quit our preſent converſation; and you know, mamma, you always allow us to digreſs a little, when a new ſubject ariſes out of the old one, that we are ſtudying; you ſay, it teaches us to think.

Juliette. I ſhall never paſs a blackſmith's ſhop, without thinking of the diſcovery of fire and iron.

Henry. He could not do any thing with the iron, if he was not acquainted with the uſe of fire.

Hortenſ. Certainly not.---I wiſh you to accuſtom yourſelves to reflect on the origin of the different objects, which hourly preſent themſelves to your view; to reaſon from the horſe-ſhoe to the firſt formation of iron in the earth, which the philoſophic author of the Economy of Vegetation ſuppoſes to be a production formed from the decompoſition of vegetables.---Charles, who is a chemiſt, underſtands this.

Charles. Mr. Wilſon has ſhewn me frequently by a load-ſtone, that iron may be found in plants, and always leads me to reaſon upon cauſes. This made my tour with him through the manufacturing towns laſt ſpring very agreeable.

Hortenſ. Every freſh acquiſition of knowledge may add to our ſtock of happineſs: our viſit to the paper-mills laſt week has amuſed us ever ſince.

Henry. When I ſee a ſheet of writing paper, I think of the ſmall ſeed it came from; and when I ſee blot-paper, I think of a ſheep.

Hortenſ. It is an agreeable contemplation to conſider the many links, by which a ſingle flax-ſeed is connected with a piece of writing paper;

paper; and the ſame in regard to that paper, which is made of woolen rags, and the ſheep; and alſo to reflect on the advantages which may be derived to mankind by their exertions of ingenuity and induſtry; but without fire and iron theſe exertions could not have proceeded to any great extent.

Harr. Is there no other metal, that could ſupply the place of iron,

Hortenſ. Iron is more valuable than other metals, as it is capable of being hardened by fire to ſo great a degree as to render it proper for the moſt powerful tools. The diſcovery of this property in iron has been thought to give the european world their great pre-eminence over that of America; and we may judge of the advantages to be derived from the uſe of iron tools by the eagerneſs, with which the inhabitants of that hemiſphere endeavour to obtain them in their intercourſe with the european nations.—But we will now, if you pleaſe, return to our botany.

Linneus has annexed to his Génera Plantárum an attempt to arrange all known vegetables according to their natural affinities; which, from the principle of his artificial method,

method, are neceſſarily ſeparated, and diſtributed amongſt the various claſſes in his ſyſtem. To eſtabliſh a natural method, or one founded on the numerous, permanent, and ſenſible relations, that one plant bears to another, has been attempted by many eminent botaniſts, and with much ſucceſs in regard to many of the génera; but, unleſs the ſpecies could alſo be arranged in the ſame manner, a ſyſtem cannot be eſtabliſhed upon theſe principles. The ſuperior excellence of an artificial ſyſtem ſeems now to be generally allowed, as more readily leading us to the knowledge of a plant, that we may wiſh to be acquainted with, ſo far as its claſs and order. However, Linneus was of opinion, that time would diſcover a natural ſyſtem; and that all plants, of what order ſo ever, would be found to ſhew an affinity to ſome others, to which they are nearly allied; and on this principle he has arranged his natural orders, of which there are fifty-eight, and rather more than a hundred génera, which he calls yet dubious. Theſe orders are well explained in Mr. Milne's Botanical Dictionary, where we will ſtudy the characteriſtic marks by which the plants contained in them are aſſembled; but we

we muſt firſt make ourſelves well acquainted with the artificial ſyſtem, which will enable us to diſtinguiſh plants, and then proceed to the natural orders, where we may learn to ſtudy the nature of them. We will lay aſide our regular botanical meetings for the preſent. In our walks, in our rides, and in our home converſations, we will exerciſe ourſelves in the knowledge of the ſeven parts of Fructification, of the various modes of Inflorescence, of the Claſſes and Orders; all of which we are to conſider as our grammar, nay, as our alphabet of botany; and when we are all perfectly ready in the grammar, we will begin to read, that is, we will ſtudy the Génera.

Harriet. I wiſh to be perfect in what I have learnt, before I attempt any thing farther.

Hortenſ. So, I dare ſay, do you all.---You will now walk, and begin the practice of your botanical knowledge.

BOTANICAL DIALOGUES.

PART THE SECOND.

DIALOGUE THE FIRST.

Génera of Plants.

Hortenſ. After a month's diſcontinuance of our ſtudies as a daily occupation I feel the greateſt pleaſure in aſſembling you again, that we may proceed in our endeavours to attain the knowledge of a ſcience, from which you all ſeem to derive ſo much pleaſure.

Harr. You cannot feel more pleaſure, mamma, than we do: we have been a little impatient the laſt week, but would not ſay ſo, for we knew you would let us begin our lectures again, as ſoon as you thought us ready for them. Juliette and Henry have had a pupil, they have taught Mrs. Pratt botany.

Jul. She is ſo good natured, that ſhe let us teach her, and ſaid it was the beſt way to improve ourſelves.

Hortenſ. You are obliged to her; for it

was

was certainly the beſt method ſhe could take of exerciſing you in what you had learnt; and as ſhe likes flowers, I hope ſhe was amuſed.

Henry. O, Mrs. Pratt liked it vaſtly!

Hortenſ. I am glad to hear it. We are now to begin with the génera of plants, which is the third diviſion in the ſyſtem; and you are all ſo well grounded in the parts of fructification, that I hope you will ſoon eaſily attain a knowledge of vegetables, ſo as to arrange them properly in the different families to which they belong. A genus is an aſſemblage of ſeveral ſpecies of plants, which reſemble each other in their moſt eſſential parts, and has often been well compared to a family, the whole of which bears one common name, while a particular one, or a ſpecific name, is given to each individual. Linneus has ſhewed us, that nature has imprinted certain characteriſtic marks on the parts of fructification, which may be eſteemed the alphabet of botany, and by the ſtudy of which alphabet we may learn to read the génera. He enumerates 26 marks or letters; the firſt ſix are taken ſtom the calyx. 1ſt, the Involucre; 2d, the Spathe; 3d, the Perianth;

rianth; 4th, the Ament; 5th, the Glume; 6th, the Calyptre; three from the corol, the Tube and Claws, forming the 7th character; the Border the 8th; and the Nectary the 9th. The ſtamens afford two marks, 10th, the Filaments, 11th, the Anthers. The piſtil three; 12th, the Germ; 13th, the Style; 14th, the Stigma. From the pericarp are derived ſeven; 15th, the Capſule; 16th, the Silique; 17th, the Legume; 18th, the Nut; 19th, the Drupe; 20th, the Berry; 21ſt, the Pome. From the ſeed are taken two; the Seed itſelf the 22d mark; and the Crown the 23d. The Receptacle of the Fructification makes the 24th; the Receptacle of the Flower the 25th; and that of the fruit the 26th, which completes the alphabet.

Jul. I think, mamma, I do not quite underſtand theſe diſtinctions about the receptacle; will you be ſo good as to explain them to me?

Hortenſ. Willingly: it is neceſſary that you ſhould have diſtinct ideas of this part of the alphabet, before you can read the compound flowers. The *receptacle* is that of *the fructification*, when it contains the corol, the ſtamens, the piſtils, and the germ, which be-

long to one flower. When it is a baſe, to which the parts of the flower are joined, and not the germ, it is a Receptacle *of the flower:* in which caſe the germ being placed below the receptacle of the flower, has a proper baſe of its own, which is called the Receptacle of the Fruit. Linneus does not mention the receptacle in his Génera Plantarum, except when he can introduce it as a character varying in ſhape and ſurface; by which ſeveral of the génera of the claſs United Anthers are diſtinctly marked.

Jul. Thank you, ma'am, I underſtand it now, and find myſelf ready in the whole alphabet.

Hortenſ. With that alphabet, or 26 marks taken from the fructification, added to the number, figure, ſituation, and proportion, Linneus has ſo well diſtinguiſhed the génera from each other, that nothing more is wanting to enable us to read the whole vegetable kingdom. When an eſſential character could be obtained he has added it, as that taken from the nectaries in parnáſſia, helleb́ore, ranúnculus, and aconíte. Could ſo diſtinguiſhed a mark be found in all génera, it would render the ſtudy of botany agreeable indeed;

indeed; and we are not to deſpair of time bringing about this much wiſhed for improvement, and it more probably will be obtained, if we content ourſelves with making the principal point of our labours the perfecting the ſyſtem of our great maſter, than if we endeavour after fame by ſeeking to eſtabliſh a new one. I have brought ſome flowers, that we may refer them to their proper génera. The hippúris (mare's-tail) and cánna (flowering reed) are of the firſt claſs and order. Examine them with the deſcriptions in the Génera Plantárum. You will ſee that the hippúris has

Cal. None.

Cor. None.

Stam. Filament one, ſitting on the receptacle of the flower. Anther half-two-cleft.

Piſt. Germ oblong, above. Style one, awled, erect, between the ſtamen and ſtem, longer than the ſtamen. Stigma acute.

Per. None.

Seed. One, roundiſh, naked.

Henry. It is very odd language.

Hortenſ.

Hortenſ. A very little time will make it familiar to you, and then you will perceive the excellence of its conciſeneſs. Is there any part of the deſcription which is not clear to you?

Harr. I do not entirely underſtand the meaning of the anther being half-two-cleft, nor of the germ being above.

Hortenſ. The firſt expreſſes that the diviſion of the anther is not very obvious. The germ being above or below, expreſſes its ſituation in regard to the receptacle; in the roſe it is below, ſo it is in apples, and in the canna, which we will now examine, and obſerve whether it agrees with the deſcription given of it. Calyx, perianth three-leaved, the leaflets lanced, erect, ſmall, coloured, permanent.

Jul. This calyx is quite right; but what does permanent mean?

Hortenſ. Continuing to adhere to the germ after the other parts of fructification are fallen off. Now for the corol.

Cor. One-petalled, ſix-parted: diviſions lanced, coaleſced at the baſe, of which the three *exterior* erect larger than

the calyx; the three interior larger than the exterior, (two erect, one reflected) conſtituting the upper lip.

Nectary petal-like, two-parted, the length and figure of the petals: the ſuperior diviſion aſcending; the inferior one revolute, counterfeiting the inferior lip of the corol.

Stam. Filament none. Anther linear, adhering to the ſuperior margin of the nectary-bearing diviſion.

Piſt. Germ roundiſh, rugged, beneath. Style one, ſword-form, adjoined to the anther-bearing nectary, lanced, the length and figure of the petal. Stigma linear, adjoined to the margin of the ſtyle.

Per. Capſule roundiſh, rugged, crowned, three-furrowed, three-celled, three-valved.

Seeds. Few, globular.

Do you underſtand the characters, when you compare them with the flower?

Harr. I do not underſtand them clearly.

Charles. Habit I ſuppoſe will make it eaſy to us.

Jul. I am confuſed with the many different characters to which I have to attend.

Henry. So am I; and the canna is not ſo eaſy as ſome flowers.

Hortenſ. It is not. I brought it to ſhew you the curious poſition of its anther and ſtyle; alſo as it is now in bloom, I thought it would be agreeable to you to know its characters. Thoſe of the cánna and hippúris I have ſhewn to you in the Génera Plantárum; we will now examine them by the ſyſtem of vegetables; you will then be able to judge which of the two books will be the eaſieſt to you. Examine both the canna and hippúris, that you may know their claſſes and orders.

Harr. They have one anther and one piſtil.

Hortenſ. You muſt then open your book at the firſt claſs, and obſerve what plants are placed in the firſt order. You find thirteen; are they all together, or divided?

Charles. There are two diviſions; ten plants are placed under the firſt diviſion; the character of which is, "fruit celled, beneath. That of the ſecond One-ſeeded." Under which there are three plants; but pray what

am

am I to underſtand from the valeriána rubra, and calcitrapa?

Hortenſ. They are two ſpecies of the valeriána, which have but one ſtamen. When Linneus has thought proper to make the circumſtance of an individual plant differing in the number of ſtamens from the reſt of its genus, the mark of a ſpecies, he has always noted ſuch plants under the claſſes to which in ſtrict propriety, according to the rule of his ſyſtem, they ſhould have been referred, and marked them with an aſteriſk; ſo you will find the lychnis dioíca noted in the claſs two-houſes; and ſeveral others in the ſame manner. If your cánna agrees with the character of the firſt diviſion, examine it with the plants contained in it, and ſee which of them it moſt reſembles.

Charles. To the ſeven firſt it cannot belong, their corols are not ſix-parted; nor to the laſt, the corol is grinning; nor to alpínia, for the corol is bellied and ſix-cleft; it muſt be either kaempféria, or cánna, they have both corols ſix-parted, lips two-parted, but here they ceaſe to agree. kaempféria has its corol flat, that of the cánna is revolute, and the calyx three-leaved. My

plant muſt be cánna. This is eaſy indeed!

Hortenſ. Now you are convinced of the genus of your plant; obſerve by what number it is marked, and turn over the pages till you find that number.

Charles. It is number 1, and here I find a fuller account of my plant. Corol ſix-parted, erect. Lip two-parted, revolute. Style lanced, growing to the corol. Calyx three-leaved.

Hortenſ. You find under the genus canna three ſpecies, diſtinguiſhed by the ſhapes and ſituation of their leaves; with which, as you have not yet ſtudied them, you have at preſent nothing to do. Your plant is the cánna índica. Do you, Harriet, refer the hippúris to its genus.

Harr. Having only one ſeed, my plant muſt belong to the ſecond diviſion, which contains only three genera; the firſt and laſt have either calyx or corol, or both, mine has neither, therefore muſt be hippúris; its number is 11, which is here; the fuller deſcription is cal. o, petals o, ſtigma ſimple, ſeed 1. I can alſo tell the ſpecies of my plant, as there are only two; one having its

leaves

leaves eight-fold, the other four-fold; mine are eight-fold, therefore it is the hippúris vulgáris, or common mare's-tail. I like this book vaſtly, it is ſo clear, and marks ſo exactly the characters of the different flowers. I greatly prefer the ſyſtem of vegetables to the Génera Plantárum. Do not you, Charles?

Charles. Yes, indeed; but I ſuppoſe we ſhould often find the fuller accounts in the Génera Plantárum of uſe.

Hortenſ. They certainly will be of uſe to you as you proceed further. When you meet with difficult plants, you will often find your doubts removed by the notes at the end of each genus in the Génera Plantárum, which mark particular circumſtances; an aſſiſtance which you will not receive from the ſyſtem of vegetables. There is another work of Linneus's, the Species Plantárum, which gives an account of the ſpecies only, with their varieties; this work is not tranſlated, which is to be lamented, though the ſyſtem of vegetables in part ſupplies its place, and is much to be prefered to it, being an abſtract of it, and of the Génera Plantárum. The Syſtem of Vegetables is a work of wonderful ingenuity; there are to be found in many

ſingle

ſingle pages of it twenty plants accurately diſcriminated from every other known plant; and more than 10,000 plants are deſcribed in the compaſs of one octavo volume. The tranſlation of this work cannot be too highly prized by all who are unacquainted with the Latin language, and are deſirous of ſtudying botany.

Jul. The diviſion of the orders ſeems to make it ſo eaſy! May I try to find out the genus of woodbine? I do not know the botanical name, ſo ſhall have no aſſiſtance from that circumſtance.

Hortenſ. Both you and Henry ſhall refer a plant to its genus. You have fixed upon rather a difficult one, but you may try. I recommend to you however to look through the whole deſcription, as you may find one circumſtance in it more obvious than another, and which may equally diſtinguiſh your plant from the others, among which it is placed. Look for the fifth claſs, and the firſt order.

Jul. O, mamma, there are a great many plants in all theſe diviſions. I had better take an eaſier flower.

Hortenſ. Do not be diſcouraged. You will

will not find your wood-bine ſo difficult to inveſtigate as you apprehend, if you proceed in regular order.

Jul. My flower cannot belong to the four firſt diviſions, the corol being in all of them beneath; in the fifth it is one-petalled and above, ſo is mine. The twelve firſt génera I do not think of, their pericarps not being berries. There are fourteen génera, all of which have berries.

Hortenſ. Firſt look at the forms of the corols, the cells of the berries are not very eaſy to diſtinguiſh.

Jul. Here are two génera with unequal corols; the firſt has the ſtigma headed, the latter oblong. My flower muſt be the lonicéra. This is a charming book!

Hortenſ. Now refer your flower to the number of lonicéra, and compare it with the fuller deſcription.

Jul. Its number is 233. Corol one-petalled, irregular. Berry many-ſeeded, two-celled, beneath. My flower agrees with all this, but there are more diviſions, what are they?

Hortenſ. They are diviſions of the ſpecies, which reduce under one head as many of the

génera

génera as agree in any one circumſtance, from which the ſpecific character is formed. If your lonicéra has a twining ſtem, you will find it in the firſt diviſion. If the peduncles are two-flowered, in the ſecond. If many-flowered, in the third. But we muſt be perfect in the génera, before we attempt to underſtand the ſpecies. Look into the Génera Plantárum for number 233, which marks lonicéra. You will ſee many obſervations below the genéric characters, which may be of uſe in diſtinguiſhing the ſpecies. Henry ſhall now chooſe his flower.

Henry. Here is a dwarf iris: will this do for me?

Hortenſ. It is better at firſt to examine flowers of a more ſimple conſtruction; and I recommend to you to make a point of this, when you are by yourſelves; and now I think you had better take a crocus, and I will explain the iris to you afterwards. You muſt carefully draw the crocus with its root out of the ground, as ſo much of the tube is covered by the earth.

Henry. The germ is below the corol. The corol ſix-petal-like, erect, expanded. Stigmas convolute coloured. I know my flower by

by its ſtigmas, how nicely they are rolled up. I do not quite underſtand ſix-petal-like.

Hortenſ. Six-petal-like ſignifies that the corol is ſo deeply divided as to have the appearance of ſix diſtinct petals, which upon firſt ſeeing the crocus, we ſhould ſuppoſe to be really the caſe. Upon further examination theſe apparently ſix petals are found to be only diviſions of a one-petalled corol, connected together by a very long tube. I ſhewed you the ſeeds of crocus laſt ſummer.

Henry. I remember them. The ſeed-veſſel begins to riſe out of the ground, as the other parts of the fructification begin to decay; and, when it is quite ripe, ſcatters its pretty pink ſeeds about the borders.

Hortenſ. You may now give me that iris, and I will explain it to you. The corol is ſix-parted, the three outer diviſions falling back, the three inner erect, and all joined together by their claws. Stigma, petal-like. Strip off the ſix-parted corol, and you will plainly ſee the ſtigma.

Harr. I ſee it, ma'am, but I ſhould have taken it for three petals.

Hortenſ. It diſtinctly marks the genus of

iris.

iris. Under each diviſion is a ſtamen preſſed down upon the falling petals of the corol. This beautiful fringe along the middle of theſe reflected petals is the nectary. Some ſpecies have another kind of nectary, conſiſting of three honey-bearing dots externally, at the baſe of the flower. The capſule alſo varies in different ſpecies; in ſome it is three-cornered, in others ſix-cornered. There are obſervations on the genus iris in the families of plants, which are very uſeful. Such génera as are nearly allied to each other are placed in regular order; and if their affinity is very great, the circumſtance, which ſeparates them into diſtinct families, is noted.

Harr. I do not obſerve that either colour, ſmell, or taſte are mentioned.

Hortenſ. Thoſe circumſtances are liable to vary ſo much, that they are by no means proper to enter into either the genéric or ſpecific character of plants, which ought always to be taken from ſuch marks as are moſt conſtant. On this account Linneus has rejected the dimenſions of the parts, except relatively, one to the other; place of growth alſo is too uncertain to be admitted as a decided character; but all theſe circumſtances of

of ſmell, taſte, colour, ſize, and ſituation are noted after the ſpecific characters in the Species Plantárum, and have their uſe, if taken in aid of the more decided marks of diſcrimination. Linneus eſteemed the nectaries of greater importance in determining the génera, than almoſt any other part; and by the uſe he has made of them, has eſtabliſhed their conſequence, though ſo much neglected and overlooked before his time, that they had not even a name. As we have begun with the genéra of plants, it is time you ſhould be acquainted with the various forms under which the nectaries appear.

Charles. Before we begin to inveſtigate them, I ſhould like to refer a flower to its genus in the claſs ſyngeneſia.

Harr. And I in monadelphia, if you will help me a little.

Hortenſ. I have no objection to your doing ſo; I was rather afraid of tiring you, or ſhould have propoſed it. You will not want much aſſiſtance. Bring ſome mallows, and gerániums, and an artichoke; we will proceed in order. Harriet will firſt take her flower, as it belongs to the ſixteenth claſs, one-brotherhood.

Harr.

Harr. I will begin with the mallow; its claſs I know; its order muſt depend on the number of ſtamens; here are many, ſo I muſt find it in polyandria. The génera contained in that diviſion are again divided by the number of females or piſtils, mine has many piſtils; but I perceive that I muſt look for ſome other circumſtance, as there are ſix génera that have the ſame character in the number of piſtils. The outer calyx of my flower is cloven into nine parts, ſo is the calyx of althæa, and of no other genus. Arils one-ſeeded and verticiled; my ſeeds are in arils, I think.

Hortenſ. They are. You may readily take them out of their litle parchment-like caſes, which are called arils. In the fuller deſcription you find that the calyx of althæa is double; ſo is that of your flower, which is the althæa officinális. Obſerve the nice order in which the ſeeds are placed round the receptacle. You will give Juliette leave to inveſtigate the geránium.

Harr. Willingly. I did not expect to find the genus of a plant ſo readily.

Hortenſ. Now you have attained a knowledge of the method of ſtudying your book,

you

you will not often find yourſelf at a loſs; though between ſome of the génera of the two-brotherhood claſs (diadélphia) the diſtinctions are ſo minute, as ſometimes to puzzle able botaniſts; therefore you muſt not be diſcouraged, if you do not always make out your plant as readily, as you have hitherto done. Juliette will now examine her geránium.

Jul. It has ten ſtamens, there are only three génera in that order. I ſee that my flower is geránium, but I am at a loſs—the deſcription mentions a capſule five-grained—here is no capſule.

Hortenſ. Look for the longer account of geránium.

Jul. O, here it is all right. One female, ſtigmas five; fruit beaked; five-grained—but why in the firſt deſcription is a ſeed-veſſel named?

Hortenſ. I imagine from miſtake, as in the Génera Plantárum there is ſaid to be no pericarp. The ſeeds are ſeparate; each encloſed by an aril, and joined to the ſtyle by long threads, which form the beak-like appearance, from whence it derives the engliſh name of crane's bill. When the ſeeds are

mature, theſe long threads, or awns, twiſt and carry them to the earth, where they vegetate, as I ſhewed you, when we were conſidering the various modes of diſperſion, which might be found in ſeeds.

Jul. What do all theſe diviſions of the gerániums mean? I have found the order to which my flower belongs by its ten ſtamens, and here they are divided from different *numbers.*

Hortenſ. Look again, and you will ſee that the ſub-diviſions of the génera depend on the number of anther-bearing ſtamens. However this equally perplexes a young botaniſt, and is now remedied by L'Heritier's new arrangement of the geránium family, which he has divided into three diſtinct génera. Eródium, Pelargónium, and Geránium. The names eródium and pelargónium ſignifying heron's-bill and ſtork's-bill, as geránium ſignifies crane's-bill. Eródium includes Linneus's diviſion with five perfect, or anther-bearing ſtamens. Pelargónium thoſe with ſeven anther-bearing ſtamens. And geránium thoſe with ten. It is doubted whether the genus geránium may with ſtrict propriety be claſſed with the flowers of one-brotherhood,

as

as it has not its ſtamens decidedly united at their baſe; at preſent it remains in the claſs to which Linneus referred it, and probably will be continued there, as the appearance of the ſtamens and piſtils ſo much reſemble thoſe of all the one-brotherhood flowers, that without very nice examination, the want of union at the baſe is not eaſily diſcovered. Your flower is a pelargónium, as you will ſee, if you count the number of its anther-bearing ſtamens.

Jul. There are ſeven. I am ſorry I muſt no longer call this plant the horſe-ſhoe geránium.

Hortenſ. The zoned pelargónium will ſoon become equally familiar to you. Four of our Britiſh ſpecies of geránium ought now to be arranged under the genus eródium, only five of their ſtamens bearing anthers; theſe are the cicutárium, the pimpinellifólium, the moſchátum, and the marítinum. We will now try our ſkill in the claſs ſyngenéſia, or united anthers. You may begin with the artichoke, Charles.

Charles. The artichoke belongs to the firſt order, the florets of which it conſiſts having all both ſtamens and piſtils. The firſt divi-

ſion contains the ligulate corols; my flower cannot belong to that; its corols are tubular—headed flowers—it may be here—the génera cárthamus and cy'nara both have their calyxes ragged. The calyx of the cy'nara has its ſcales channelled and thorny. Here I will reſt; my flower is cy'nara—is it not, ma'am?

Hortenſ. It has much the appearance of being ſo; when you have examined it by the further deſcription, we can then pronounce decidedly.

Charles. The number of cy'nara is 928, calyx dilated, imbricated with ſcales fleſhy, end-nicked with a point. I will venture to decide, that my flower belongs to the genus cy'nara.

Hortenſ. You are right in your deciſion. Obſerve the beautiful pappus which crowns the ſeed, and the ſize of the receptacle, which is the part that we eat of the artichoke, or the cy'nara ſcólymus; we alſo eat the fleſhy baſe of the large leaves, which form the calyx. Will you, Harriet, diſſect the dandelion?

Harr. If you pleaſe, ma'am. I am however a little afraid I ſhall find it difficult to underſtand the minute diſtinctions by which the

the génera are ſeparated, but I will try. I know it belongs to the firſt order, and the corols being ligulate, that it muſt be of the firſt diviſion. The receptacle, I ſee, is the firſt mark of all the génera of this diviſion. The receptacle of dandelion is clear from either down or chaff, ſo cannot belong to the ſeven firſt génera. I will paſs the pappus, and obſerve the calyx, which anſwers the deſcription of that of leóntodon, being imbricated with looſe ſcales; there is no other genus that this character belongs to. This pappus puzzles me; I do not diſtinctly know the meaning betwixt plumy and hairy.

Hortenſ. The pappus of ſeeds in the compound flowers is either formed of ſimple hairs, or of hairs ſet with other finer hairs; in the former caſe the pappus is called hairy, in the latter plumy or feathery. The pappus of artichoke, cy'nara, is hairy. This minute circumſtance reſpecting the pappus of the ſeeds is of great uſe in marking the génera, therefore ſhould be well underſtood. If you expoſe it a little to the air to dry, you will then more clearly perceive of which kind the pappus in your flower may be eſteemed.

Harr. I ſhould not ſay that this pappus was plumy, but I ſuppoſe I do not look at it properly. Did Linneus obſerve all the minute particulars, from which he has formed the génera, without glaſſes?

Hortenſ. He tells us that he has not deſcribed any parts, but thoſe which he has ſeen with his naked eye. It is not from want of proper inveſtigation, that you do not find the pappus of the dandelion ſeed plumy. Its deficiency in this particular of the generic character has been thought ſufficient by Scopoli to make another genus of it, which he has named Hedypnois; however as Linneus has uniformly ſhewn his diſapprobation of multiplying the génera from the ſingle circumſtance of an individual differing in any one part of fructification from its family, it would perhaps be better to follow his method in this reſpect. In the obſervations, which follow the géneric characters in the families of plants, you will find the leóntodon taráxacum, which is your plant, noted for having the pappus of its ſeeds ſimple, or capillary. Some peculiarities in a few other ſpecies are alſo marked, which might have ſeparated them from

their genus with as much propriety as the taráxacum has been. You ſeem to be ready in the method of inveſtigating the claſs of compound flowers; you will meet with many that may be more eaſily diſtinguiſhed than thoſe which we have now diſſected. The burdock, arctium lappa, is ſtrongly marked, by the outer ſcales of its calyx being hooked at the extremity with very ſharp ſhining hooks. The onopórdon, cotton thiſtle, is diſtinguiſhed from the cárduus, the true thiſtle, by having a receptacle ſomewhat like an honey-comb, that of cárduus being hairy. Hence you perceive the excellence of the Linnean method. Mr. Curtis has in many of the génera of this difficult claſs diſcovered conſtant marks, by which they may be diſtinguiſhed in different ſtates of growth. In the onopórdon acanthium, when the flowering is over, he has obſerved that the innermoſt ſcales of the calyx cloſe ſtrongly together, and preſerve the ſeed, contrary to the calyx of cárduus, and moſt other génera of the compound flowers, which as I before remarked, expand and diſperſe their ſeeds. The ſmaller flowers of this claſs are more

difficult to inveſtigate, from the minuteneſs of their parts of fructification; but if you proceed in the ſame manner, that we have done with the larger ones, which we have now diſſected, you will ſoon obtain a competent knowledge of them. We will examine a few of the umbelliferous plants, and then, I think, you will be ſufficienly entered into the manner of ſtudying your book. Juliette and Henry will like to examine the umbelled flowers. Here is the water-parſnip for you, Juliette, and the ſhepherd's needle for Henry.

Jul. Thank you, mamma, I like making out the flowers. When I find myſelf right, I am quite happy.

Hortenſ. Both you and Henry have been ſo attentive, that I have had great pleaſure in inſtructing you. Now take your flower, and examine thoſe florets, which are nearly ready to open, as you will not eaſily determine its claſs, if you attend only to thoſe which are fully expanded, the anthers frequently dropping off as ſoon as they arrive at maturity.

Jul. Here are five anthers not united, and two

two ſtyles; to the fifth claſs and the ſecond order my plant muſt belong; and to the diviſion of flowers, five-petalled, above; two-ſeeded, umbelled. Theſe flowers having alſo univerſal and partial involucres. Now begins the difficulty—Flowers *floſculous* and *fertile*. What does that mean?

Hortenſ. Floſculous implies that all the florets are equal; the term *radiate*, that the florets of the circumference differ from thoſe of the centre; fertile ſignifies that the ſtamens are furniſhed with anthers; abortive, that they are deficient in them; whereever you find the particle ſub uſed, it means the ſame as the engliſh termination *iſh*; ſo ſub-umbelled, expreſſes that the flowers do not form a perfect umbel. I think there are no other terms made uſe of in this claſs, but what you will underſtand; if there are, I will explain them to you.

Jul. Thank you, ma'am, I can go on now. My flower is floſculous and fertile, and the petals hearted, but ſo are many others.

Hortenſ. Attend to the form of the ſeeds of your plant, as from that circumſtance the genus is frequently marked; and in the umbelled

belled plants you may generally find at the ſame time both flowers and ſeeds in a fit ſtate for inveſtigation.

Jul. My flower, I think, is ſiúm; the ſeeds are almoſt egged; that means, I ſuppoſe, almoſt of the ſhape of an egg; and ſtriated, that is *ſcored*, is it not, mamma?

Hortenſ. You are perfectly right; go on.

Jul. I muſt look for number 348: here is no further deſcription than that the involucre is many-leaved. How eaſy this book is, and how hard it ſeems at firſt. Now, Henry, will you take this ſhepherd's needle?

Henry. Pray give it me. It belongs to the ſame claſs and order with your flower, but not to the ſame diviſion, as it has no univerſal involucre. I ſhall look for the ſeeds firſt. The ſeeds of ſcándix are oblong, ſo are theſe of the ſhepherd's needle; they agree too in other particulars; the flowers are not alike in the centre and circumference; the number is 357; here is a long deſcription. Cor, radiated; fruit, awled; petals, end-nicked; florets of the diſk, often male; thoſe of my flower have only ſtamens. Diſk means centre, I ſuppoſe. This fruit is ſhaped like an awl, and is very long.

Hortenſ.

Hortenſ. The centre and circumference are named the diſk and the ray, both of which terms are frequently uſed in the characters of the compound flowers. Your plant is a ſcándix. Its ſpecies is diſtinguiſhed by the very long beak with which the ſeeds are furniſhed, and is called ſcándix pecten, or comb ſcandix. We will diſſect this gentianella and centaury, and then part for the morning. Both theſe flowers muſt belong to the ſecond order of pentándria, or five ſtamens. Their flowers are one-petalled, and beneath; their fruit, capſules; which reduces the number of genera to four; amongſt thoſe four you are to look for them. Cut the capſules acroſs, and preſs out the ſeeds, you will then ſee in how many cells they were contained.

Harr. Here are two génera, which have capſules of one cell, and two valves. Pray what is the exact difference between a cell and a valve?

Hortenſ. The valve is the coat by which the fruit is covered externally. The cell a hollow inward diviſion, in which the ſeeds are lodged. So you will ſee in the flowers that you are examining, the outer coat is di-

vided into two parts, but that the ſeeds are contained in one hollow cell. The tubular form of the corol of gentianella decides it to be of the genus gentiána; and as the form of the corol is ſaid to be indeterminate, that is, to vary in different ſpecies, you may refer your centaury to the ſame genus, as it agrees in all other particulars.

Harr. The gentianella and centaury are ſo unlike in their appearance, that I ſhould have been much puzzled if I had examined them by myſelf.

Hortenſ. It is on that account that I brought them. The ſtructure of thoſe ſpecies of gentiána, which are known by the name of gentianella, is ſo peculiar as to ſeem to give them a right to form a genus of themſelves; and the centaury is now placed by Mr. Curtis, in the genus chirónia, from its anthers being twiſted, after having ſhed their duſt; a diſtinguiſhing character of that genus, alſo from its outer habits ſo much reſembling thoſe of chirónia. Such reſpectable authority as Mr. Curtis muſt have great weight; accordingly you obſerve that I have marked in my Syſtem of Vegetables, the gentiána centaurium,

taurium, as a chirónia. We will meet to-morrow, and ſtudy the nectaries, and the flowers of a few more claſſes. We have gone through our lecture to-day with great ſucceſs.

DIALOGUE THE SECOND.

Nectaries of Plants.

Henry. We have been very buſy, mamma, and we think we have made out two or three flowers by ourſelves. Is this ſelf-heal, prunélla? and this houſe-leak, ſempervívum? We have brought ſome churn-ſtaff, which you promiſed to explain to us; and here is a flower, that we are not quite ſure of its claſs; and there is ſomething odd in the houſe-leek.

Hortenſ. I muſt arrange your queſtions before I can anſwer them. Your ſelf-heal is prunélla. Your houſe-leek ſempervívum tectórum. I will explain the churn-ſtaff to you, and alſo the odd appearance on the flowers of houſe-leek. But firſt tell me from what circumſtance you decided upon the génera to which theſe plants belong.

Henry. The two-forked filaments ſhewed us the prunélla directly; and we luckily firſt gathered a flower of the houſe-leek, that had not the odd appearance, which this bunch has, ſo traced it to the eleventh claſs and ſixth order,

der, and there was only one genus in that order: we ſhould have been puzzled, if we had ſeen this flower firſt; we cannot diſtinguiſh the piſtils from the ſtamens.

Hortenſ. The appearance, which has perplexed you, is accurately deſcribed by Mr. Curtis from Haller, who has given a very minute account of this plant; its filaments frequently, even while young, are evidently enlarged towards their ends, and throw out from their ſubſtance little oblong white corpuſcles, like the eggs of ſome inſect: the filaments thus enlarged, are more glutinous than thoſe in their natural ſtate, and have their anthers ſomewhat imperfect. As the fructification advances towards maturity, the filaments continue to enlarge about the middle, while the top is drawn out to a kind of beak, in which ſtate they might be miſtaken for the piſtil. On cutting them through they appear hollow, and to contain ſome of the ſame corpuſcles, which may be ſeen on the outſide of many of them, ſo that it would be impoſſible to know them to have been originally filaments. This ſhews you the advantage of examining flowers in their different ſtates of maturity, and before the full

expanſion

expanſion of their corols. The ſempervivum is nearly allied to the ſédum, but differs in having more than five petals; it is alſo liable to increaſe in its number of piſtils, when it grows luxuriant. Have you attempted to refer the churn-ſtaff to its proper genus?

Harr. We did attempt it, ma'am, but could not even make out the claſs.

Hortenſ. We are obliged to Mr. Curtis for an accurate knowledge of the euphórbia, which is the botanic name of your churn-ſtaff. He juſtly remarks, that the Linnean characters of this family will not in any of the Britiſh ſpecies, even guide us to its claſs. The ſtamens are very minute; there are ſeldom more than two or three that appear above the calyx, the reſt are concealed within it, and rarely amount to twelve in number, ſo that it fails in the eſſential character of the eleventh claſs, to which it belongs, that character requiring that the flowers contained in it ſhould not have fewer than eleven ſtamens, or more than nineteen: the ſmallneſs of the ſtamens, and the milky juice, which flows ſo plentifully from every part when bruiſed, renders the inveſtigation of the euphórbias,

phórbias, on the principles of the Linnean ſyſtem, extremely difficult. I can however give you a clear idea of the flower and fruit of this ſingular genus, by diſſecting ſome flowers of the large garden ſpurge tree, or euphórbia lathyris. The part which Linneus had called the corol, Mr. Curtis has now named the nectary. There is a ſingular appearance which crowns the ſeeds of theſe plants, and which I have long obſerved, without being able to diſcover the uſe of it; this extraordinary appendage has not eſcaped the notice of Mr. Curtis, and is termed by him a button; it is of a fleſhy ſubſtance, of a greyiſh colour, heart-ſhaped, and ſtands looſely on a ſhortiſh foot-ſtalk. In the tree ſpurge it gives beauty to the large black ſeed which it crowns. Mr. Curtis takes notice of the defects, which occur in the ſyſtem of Linneus, with ſuch candour, as muſt every one capable of judging of its general excellence, and who is a true lover of the ſcience of botany. No one has done more towards rendering the knowledge of this agreeable ſcience eaſy of attainment, than he has done, having followed Linneus in his endeavour after the diſcovery of eſſential characters, and

in many génera having been ſucceſsful in his purſuit. The outer habits and milky juice of the euphórbias are ſufficient marks of diſtinction in that genus; but the curious ſtructure of their fructification well repays the trouble of inveſtigation.

Charles. It does indeed. How much beauty in flowers is concealed from us, when we do not underſtand botany! Will you be ſo good now, ma'am, to examine this plant, which has puzzled us? We ſuppoſe it muſt belong either to the 21ſt, 22d, or 23d claſs, but cannot decide which.

Hortenſ. It belongs to the 23d claſs, polygamia, or plants containing flowers with ſtamens and piſtils, ſtamens without piſtils, and piſtils without ſtamens. Your flower is the parietária officinális, and is remarkable for the curious manner in which its anthers ſhed their duſt. Each filament has a peculiarity of ſtructure, which renders it highly elaſtic: there are four in number; on their firſt appearance they all bend inward. As ſoon as the duſt is ready to be diſcharged, the warmth of the ſun, or the leaſt touch of a pin, will make them inſtantly fly back with a degree of force, and diſcharge a little cloud

of

of duſt. We will obſerve this proceſs to-morrow, if it is a bright day, as it is beſt ſeen, when the ſun is hot, and ſhines on the plant.

Henry. I ſhall like to ſee that vaſtly. What is that very little plant, mamma, in that little blue ſaucer of water?

Hortenſ. I have brought it to ſhew you the remarkable minuteneſs of its parts of fructification. It is the centúnculus mínimus, or leaſt centúnculus, which however is an unneceſſary appellation, as there is only one ſpecies known; you may refer it to its claſs, order, and genus.

Jul. Here are four-ſtamens and one-piſtil, it belongs to the fourth claſs and firſt order. Corol wheeled, calyx four-parted; capſule one-celled, circumſciſed, that is cut round, I ſuppoſe. The flowers are all cloſed; but as the other parts agree with the deſcription given of them, the corol is wheeled, I dare ſay.

Hortenſ. The extreme ſmallneſs of the corol, and the circumſtance of its never opening, but when the ſun ſhines ſtrongly upon it, makes the form difficult to be obſerved; it is however wheeled, and has this peculiarity at-

tending it, different from moſt of the wheel-form flowers. The corol remains after the ſtamens have ſhed their duſt, and covers the top of the capſule. The diſtinguiſhing circumſtance of this little plant is that of its round capſules, ſeated in the boſom of the leaves. We will now begin with the nectaries, before we proceed to inveſtigate the paſſion flower, órchis, and árum, as in thoſe génera they are of particular conſequence.

Harr. I ſhall like to be acquainted with the different kinds of nectary, but I am rather ſorry, when any thing interrupts the inveſtigation of the génera. We have not diſſected any of the butterfly tribe of flowers, nor of the claſs four-powers.

Hortenſ. You are all ſo ready in the botanical language, and have attained ſo clear a knowledge of the method of reading your plants, that it is unneceſſary to proceed with them in regular order, as a taſk; and it will be more amuſing to refer a flower to its genus, as it excites your curioſity, than if you gathered a certain number every day for that purpoſe.

Jul. We can try to make them out ourſelves, and then bring them to you, mamma, for

for further inſtruction; but pray tell us about the nectaries?

Hortenſ. Linneus has defined the nectary to be that part of the corol, which contains the honey, having a wonderful variety both as to ſhape and ſituation, ſometimes being united with the petals, and ſometimes ſeparate from them. The lower part, or tube, of one-petalled corols, generally is found to contain a ſweet juice, which is the honey. In the flowers of árbutus únedo (ſtrawberry tree) it is ſo profuſe, as to run out, when the corol is opened, and to give the flowers a ſtrong ſcent, reſembling that of the honey of bees; it is alſo found at the baſe of the petals, in many of the butterfly tribe of plants. Clover (trifólium pratenſe) contains much of this liquor. The chief diſtinctions of the nectaries, which adhere to any of the parts of fructification, are, *firſt*, the ſpur-form, which is found in one-petalled flowers, as ſnap-dragon (antirrhínum), and valerian (valeriána); and in many-petalled flowers, as in órchis, lark-ſpur (delphínium), and víola; *ſecond*, ſuch as are on the inſide of the petals, as in crown imperial, and all the family of fritillária, though in none ſo obvious as in

the ſpecies imperiális, in ranúnculus, and dog-tooth (erythrónium). The nectary in lily (lílium) is that raiſed line which you ſee run down the petal lengthways; *third*, the nectaries which crown the corol, as in paſſion flower, paſſiflora, narcíſſus, ly'chnis; *fourth*, on the calyx, as in naſturtion (tropæolum), being a ſpur attached to the calyx; *fifth*, on the ſtamens, which in bay (laúrus nobilis) are three glands ending in two briſtles, ſurrounding the germ; *ſixth*, on the germ, as in ſome ſpecies of iris, and in hyacinth, and the plants of the claſs four-powers, tetradynamia; *ſeventh*, on the receptacle in ſempervívum, and mercury, mercuriális; *eighth*, all thoſe nectaries which are not apart from the corol, but whoſe ſingular conſtruction does not admit of their being placed among any of the kinds I have enumerated, as in nettle (urtíca), the nectary is ſituated in the centre of the ſtamen-bearing flower, very ſmall, in the form of a cup. In fact, the term nectary is applied by Linneus to every part of fructification, which from its ſingularity cannot be ranked among the ſeven regular parts of a flower; it has been doubted whether this part exiſts in every flower, and cer-

certainly we find many deſtitute of it, as a diſtinct apparatus; but if any part, wherein this ſweet juice, called honey, is found, has a right to be termed a nectary, I think I would venture to decide, that there is no flower without it; and that Linneus was of this opinion appears from his having named it, in the Syſtem of Vegetables, as a conſtant appendage of the corol, calling it the honey-bearing part proper to the flower, diſtinguiſhing it into two kinds, *proper*, when ſeparate from the petals and other parts. *On the petals*, when forming a part of the corol, it not being noticed in many of the génera may ſeem an objection to Linneus having conſidered it as a conſtant part of the fructification; but he could not be ignorant of its exiſtence in the compound flowers, the lower part of the florets, of which they conſiſt, generally containing the juice in queſtion, and yet he has not named it in any of the génera of the claſs united anthers (ſyngenéſia), except thoſe of the order monogamia, or ſimple flowers, which have ſpur-form nectaries; whence I conclude he omitted it in all thoſe génera, where its ſtructure was not ſuch as to form a marked

character. As a further proof of this, the nectary is not named in the one-petalled flowers, though nothing can be more evident than the honey contained in their tubes; and Linneus has, in ſome of his works, called the tube of a one-petalled corol a true nectary. Among the nectar-bearing ſtamens, he enumerates thoſe of the fraxinella (dictámnus), I ſuſpect however that the reſinous matter, with which they abound, is not of the nature of honey, but ſimilar to that we find upon the ſtalks, which is ſo inflammable as to take fire on the approach of a candle, and to burn like ſpirit of wine, till it is entirely exhauſted.

Henry. I remember, mamma, you ſet a fraxinella on fire laſt ſummer, and we wondered the ſtalks were not burnt through.

Hortenſ. So long as any of this eſſential oil remains, it is caught by the flame, which runs rapidly along the ſurface of the ſtem till it finds no more food, and then is extinguiſhed, not having force ſufficient to burn the green ſtalks, which you may underſtand by eſcaping unhurt from the flame of a ſnap-dragon, which runs along your fingers without ſingeing them: but to return to the nectaries,

taries, which are placed ſeparate from all the other parts of fructification; the ſtructure of which is an object that merits the ſtricteſt attention, not only as diſtinguiſhing decidedly one genus from another, but from the artful manner in which they are formed for the purpoſe of preſerving from inſects the precious ſtore contained in them. The moſt remarkable are thoſe of the monk's-hood (aconítum napellus), of chriſtmas roſe (helléborus niger), parnáſſia and columbine (aquilegía), and of the órchis tribe. In aquilégia the nectaries have been thought to reſemble the neck and body of a bird, and the two petals ſtanding upon each ſide to repreſent wings, whence its name of columbine, as if reſembling a neſt of young pigeons, while their parent feeds them. In helléborus the nectaries are placed in a circle like little pitchers, and add much to the beauty of the flower, but I know not any which are a greater ornament than thoſe of the parnáſſia. I have not yet been able with certainty, to diſcover the gland which bears the honey. The beautiful tranſparent globules which fringe the margins of the five ſcales, called nectaries, may probably contain ſome viſcous juice,

juice, which ſerves to guard the honey from the depredation of inſects; but that we have nothing to do with at preſent. If you have attained a knowledge of the different ſpecies of nectaries, with their varieties, it is all that this part of our ſtudies requires.

Charles. I have perfectly diſtinct ideas of them, ma'am.

Harr. So have I.

Jul. I often bite the bottom part of the petals of pinks, and taſte ſomething ſweetiſh, muſt I therefore call the claws of thoſe petals nectaries?

Hortenſ. If you diſſect a pink with care, when the ſtamens firſt become mature, you will find the baſe of the calyx filled with honey; by what part of the fructification that juice is ſecreted, is not perhaps an eaſy matter to determine, but if that were determined, that part muſt be called the nectary.

Henry. My doves to my venus's chariot are the nectaries of the monk's-hood, are they not, mamma?

Hortenſ. They are; and with the aſſiſtance of a ſtrong imagination, and taking away the hood, which covers the nectaries, you form a tolerable chariot: exert your fancy a little further,

further, and I will ſhew you a ſtore of honey, which from the ſmallneſs of its quantity, and the elegance of the apparatus to contain and preſerve it, muſt belong to the queen of the fairies. Obſerve theſe flowers of mignionette, reſéda odoráta; theſe two-fringed petals growing cloſe together form a little caſket, or box, the lid of which is this ſmall ſcale growing betwixt the ſtamens and petals, and preſſing ſo cloſely on the latter as to ſhut up ſecurely a ſmall drop of honey in the hollow formed by their union. I have frequently ſeen bees baffled in their attempts to plunder this honey, not being able to open the lid ſufficiently to allow of the inſertion of their trunks.

Henry. I like watching bees about the flowers, but they go ſo quick from one flower to another, that I can ſeldom ſee their trunks.

Hortenſ. They attend only to their buſineſs, and are ſo provident of time, that they never loſe a moment in idleneſs. When we ſtudy inſects, you will be ſtruck with admiration, as we enter into the laws and economy of thoſe tribes, with which mankind have made themſelves moſt acquainted. We have

have accounts of bees from every writer on natural hiſtory, as every one has an opportunity of obſerving their ingenuity to a certain degree. It is however equalled, if not excelled, by many other inſects; but our knowledge of the general laws, by which many of their tribes are governed, is ſo imperfect, that we cannot accurately compare one with another; but ſo far we know of them as to give us cauſe to believe, that they do not act from the blind impulſe of inſtinct, but that their ſenſes enable them to vary their operations as occaſion requires. Some evidently poſſeſſing the ſenſe of touch in an exquiſite degree, and their occupation requiring more conſtant exertion of their powers, we are authoriſed to believe, that thoſe tribes are endued with a greater proportion of knowledge and ingenuity. You will be ſurprized to hear me mention the ſpider, as an inſect which ſtands foremoſt in theſe qualifications.

Jul. A ſpider, mamma? I do not *like* a ſpider.

Hortenſ. Becauſe you are not acquainted with it. You obſerve only its outer form, which is not very prepoſſeſſing, and do not conſider

conſider the merits, which may be found under that form. If you will take the trouble to obſerve a ſpider, when ſhe is making her web, you will feel more reſpect for that poor little inſect. This web is a net, which ſhe forms to entangle her prey, from a material given her by nature to ſupply her want of wings in travelling from place to place; and when uſed for the purpoſe of migration is formed into a long line, ſpun from her own body. When employed to make her web, you will find her aſſiduouſly adapting the form of each net to its ſituation, and ſtrengthening thoſe lines that require it, by joining others to the middle of them, and attaching thoſe others to diſtant objects; with the ſame individual art, that you have ſeen your brothers uſe in ſupporting the maſts, and extending the ſails of their ſhips. You muſt all have ſeen another wonderful circumſtance of management in this little creature, which is her counterfeiting death, when put into terror; and as ſoon as the object of terror is removed, recovering and running away.

Henry. I have ſeen that, when I have put my finger near a ſpider, it has rolled itſelf up like a little ball, and as I have taken away

away my finger, it has moved, and then again rolled up, when I have come near it once more; but I did not know why it did ſo, or I would have let it alone.

Hortenſ. I dare ſay you would: but learn from this, that want of thought is often as productive of cruelty to our fellow creatures, as the moſt deliberate tyranny. There are few things which tend to humanize the mind more, than a knowledge of natural hiſtory. From ignorance, we are apt to conſider the numerous tribes of inſects, which ſurround us, as being equally unfeeling with the ſtones, that we tread upon; and few people are aware, that by the death of an ant, or bee, a whole colony may be thrown into confuſion.

Henry. I have taken great care not to tread upon ants, ſince you told me their hiſtory, mamma. The ſpiders nets ſeem ſo ſlight, that they cannot hold any ſtrong inſect, I ſhould think.

Hortenſ. The nets of the ſpiders of this country have the appearance of thin gauze, but from the art with which they are conſtructed, are perfectly well adapted in ſtrength to the prey, that they are intended to entan-

gle, which conſiſts of different kinds of flies. In South America there is a large ſpider, which conſtructs nets of ſo ſtrong a texture, as to entangle ſmall birds, particularly the humming-bird; and in Jamaica there is another ſpider, which digs a hole in the earth obliquely downwards, about three inches in length, and one inch in diameter; this cavity ſhe lines with a tough thick web, which when taken out reſembles a leathern purſe; but what is moſt curious, this houſe has a door with hinges, like the cover I have ſhewn you in ſome ſea-ſhells; and herſelf and family, who tenant this neſt, open and ſhut the door whenever they paſs or re-paſs. But we have digreſſed widely from our ſubject, and we will now think of the curious plants, which belong to the claſs gynándria, or ſtamens growing upon the piſtils.

Jul. But will you, mamma, ſome time tell us more about inſects?

Hortenſ. I promiſe to treat you, by letting Charles read to us to-night ſome parts of a ſection on the ſubject of inſtinct, in a book entitled Zoonomia, lately publiſhed by an eminent philoſopher, who is not more celebrated for the depth and acuteneſs of his reſearches, than for

for the agreeable and diſtinct manner, in which he gives them to the world. We ſhall there find ſome amuſing and inſtructive hiſtories of the economy of different animals, which will ſerve to give you an idea of the wonderful mechaniſm and art, which they employ in the conſtruction of their habitations, and the care of their progeny. But you muſt regularly enter into the ſtudy of them, before you can receive the amuſement, which ſuch a ſubject is capable of affording.

Henry. We read a great deal about all kind of animals, and it is very entertaining; but I never remember any thing ſo well as what we read in the Natural Hiſtory of Birds.

Hortenſ. * There are few books ſo well managed as that you ſpeak of. The ſubjects are ſcientifically arranged, and made intereſting by the manner in which they are treated. You may look over a whole library for children, in general, and not find a ſubject to which you wiſh to refer; but in your book of the Natural Hiſtory of Birds, the

* Natural Hiſtory of Birds by Mr. Galton, intended for the amuſement and inſtruction of children, with copper-plates, coloured, 1l. 1s. ſold by J. Johnſon, St. Paul's Church-yard.

whole

whole matter being divided under ſeparate heads, you are never at a loſs. My object has ever been, that you ſhould read with method; and you find the benefit of having done ſo, from your memories being more clear and retentive, than thoſe of moſt children. That I may be ſure, I have not confuſed you by our diſſertation on ſpiders, pray tell me what we laſt treated of in our botanical ſubject?

Jul. You had, ma'am, deſcribed the curious nectaries of mignionette. After having explained to us the different forms under which the nectary appears, whether joined to, or ſeparate from the corol.

Hortenſ. Very well. In this paſſion flower, from the large ſize of its parts of fructification, we may eaſily examine the poſition of the ſtamens and piſtils, its botanical name is paſſiflóra. The petals and calyx nearly reſemble each other in front, both being of the ſame form and colour; theſe beautiful rays are the nectaries; the ſtamens are five, at firſt view having the appearance of being placed on the piſtil, but in reality growing from the bottom of the germ, where it joins the little pillar on which it is elevated. The

three large ſtyles are very evident, and from their purple colour, and that of their ſtigmas, give much beauty to the flower. The nectaries form the principal feature in the flowers of this genus, and in ſome of the ſpecies have the appearance of a baſket made of blue and white beads ſtrung upon wire. The generic characters of paſſiflóra, given by Linneus, do not agree with any of the ſpecies which I have ſeen, and there is ſome doubt whether the ſtamens can be properly ſaid to grow on the germ. Perhaps the ſmall pillar, to which both the ſtamens and germ adhere, may with more propriety be conſidered a receptacle. Linneus calls this pillar a ſtyle, but if it be one, we are at a loſs to know what part of the flower theſe three apparent ſtyles, with their ſtigmas, muſt be called, and to which he gives the name of ſtyles. This is one of the few génera that we find not juſtly deſcribed. Be ſo good to give me that ſpotted órchis, or king's thumb, as you call it. I ſee you have diſſected ſome of its flowers. Have you been able to gain a diſtinct idea of the parts of fructification.'

Harr. We found them ſo different from thoſe of common plants, that we did not ſpend

ſpend much time over them, as we knew we ſhould underſtand the parts ſo much better, if we examined them with you, ma'am.

Hortenſ. It is not an eaſy matter to obtain a diſtinct idea of the parts of fructification of the órchis tribe: a peculiarity of ſtructure runs through the whole of them, ſo different from what we commonly meet with in other plants, as to make them well worth inveſtigating. Attend to the natural flower, and to the plate before us, which, as it ſhews all the parts magnified, will be of great aſſiſtance to you. I have in my hand a ſingle flower on its peduncle, with its bract, or floral-leaf, in which you ſee the twiſted germ, the petals, the lip and form of the nectary of their natural ſize. I will open it, and ſhew you the anthers, but you will underſtand them better from the plate. Each flower contains two ſtamens, the ſtructure of which is very curious. Each of theſe ſtamens is contained within a bag or caſe, the edges of which fold over each other, and open in front, as the plant advances towards maturity; at this period, in many of the órchis tribe, they hang down, out of their caſes, towards the ſtigma, on the ſlighteſt pull they are drawn

out. Draw them gently, Juliette, with a needle, and obſerve the baſe of each filament.

Jul. Here is a tranſparent globule, but ſo ſmall, I cannot ſee it diſtinctly.

Hortenſ. Compare the ſtamens with the drawings; in them you plainly ſee the globules at the bottom of the ſtamens, and at the top a club-ſhaped ſubſtance, of a yellow colour, in the flower we are examining, and generally ſo in others; the ſurface of which is covered with ſmall grains, theſe we muſt conſider the anthers. We will now lay all the parts before our microſcope, and you will find the repreſentation, given in the plate, to be moſt exact; and that the anthers are compoſed of irregularly ſquare corpuſcles, united together by fine elaſtic threads: that theſe corpuſcles produce the ſame effect of the anther-duſt of common flowers, ſeems highly probable, though at preſent the manner of their doing ſo is not known.

Charles. This ſeed-veſſel is full of good looking ſeed.

Hortenſ. Many of the órchis tribe have their ſeed-veſſels large, well formed, and filled with ſeeds, which though extremely minute,

minute, appear perfect. The ſmallneſs of the ſeed is certainly no argument againſt its vegetating. Some of the ferns, whoſe ſeeds are much ſmaller, are well known to be propagated from ſeed, and to come up ſpontaneouſly in hot-houſes, where the original plant has ſcattered its ſeed: probably by minute attention we may be able to diſcover the ſeedlings of órchis.

Harr. You have ſowed the ſeed, I think, ma'am.

Hortenſ. I have done ſo, but not with ſucceſs. However, I am of opinion, that the orchiſes are propagated from ſeed, as many young plants of them are frequently found together, and it is well known that they never increaſe plentyfully by the root; but in this, and all other parts of natural hiſtory, we can only hope for ſatisfaction from accurate and repeated obſervation. Next year I hope you will underſtand enough of the ſubject to eſtabliſh an experiment-garden.

Jul. That will be charming.

Hortenſ. I hope you will find it ſo. To become an experiment-maker requires much patience, and impartial judgment.

Jul. Ah, mamma, you doubt my pa-

tience! But what has partiality to do with making experiments?

Hortenſ. If you watch a bed of orchiſes, in the hope of finding ſeedlings on it, you will eagerly catch at every circumſtance that can favour this hope. It is the buſineſs of an experiment-maker to be always looking for circumſtances which make againſt his theory, and not for it; and to ſtate as ſtrongly what he remarks unfavourable, as favourable to his wiſhes. But you are at preſent too young to enter deeply into this part of the ſtudy. You will however be equal to aſſiſting your brother and Harriet, when they begin experiments, and in time become an able experiment-maker yourſelf. You have an induſtrious application in all you do, which is an excellent foundation; a little impetuoſity, and impatience under diſappointment, is what we have to get the better of; and I flatter myſelf, I ſee them combated with good effect. You cannot be at a loſs to know the ſpecies of órchis, that we have juſt now been examining; its ſpotted leaves and bright purple flowers will generally be marks ſufficient: but that glaſs, which is filled with ſuch a ſeeming variety of them, you

you will be ſurprized to find contains only one ſpecies.

Harr. Indeed I ſhall, ma'am; for I gathered them for ſo many different kinds.

Hortenſ. They are only ſo many varieties of the órchis morio, which ſhews you, how little to be relied on are the colours of the corol, which in this ſpecies aſſumes all the changes of colour, from a deep purple to a white; yet it is obviouſly diſtinguiſhed from all our other órchiſes, as through every variety it retains more or leſs ſtrongly the character of having its two outermoſt petals marked with green, parallel lines. In this órchis the anthers are green.

Henry. I ſee the lines; they are ſo exact, that they look as if they had been drawn by a camel-hair pencil. Pray how many kinds of órchis are there in England?

Hortenſ. There are ten diſtinct britiſh ſpecies of the real órchis; but by common obſervers ſome other génera have been confounded with them, which, you will ſee, ought not to be ſo. Linneus has diſtinguiſhed the different génera of theſe curious plants by the form of their nectaries. The flower commonly known by the name of

bee órchis belongs to the genus of óphrys, the diſtinguiſhing character of which is the nectary hanging down longer than the petals, and being ſlightly keeled behind only. You ſhall compare this bee órchis, which is the óphrys apífera, with the plate of its parts of fructification; in * Mr. Curtis's London Flora, you will find them moſt accurately given; alſo we will ſtudy this tway-blade, or egged óphrys, with the plate of its parts magnified, which will make the inveſtigation of it eaſier to you, and you will ſee the great difference there is in the ſtructure of the óphrys and orchis génera. Linneus has formed the ſpecific characters of ſeveral of theſe flowers from peculiar circumſtances found in the nectary; that of the tway-blade, or óphrys ováta, is marked by its nectary being two-cleft. The leaves of theſe two ſpecies of óphrys differ materially from thoſe of the orchis tribe. The root of the óphrys apífera reſembles thoſe of órchis genus, which are bulbous, but that of the ovata is fibrous. Linneus, in the generic

* For the convenience of thoſe, who may not have acceſs to that valuable publication, a plate of the orchis and ophrys is given at the end of this dialogue.

cha-

characters of the four families of órchis, ſaty'rium, óphrys, and ſerápias, which are all cloſely allied, marks the circumſtance of the germ being twiſted as a peculiarity common to them all. It certainly does not run through all the ſpecies, and I ſuſpect it will be found excluſively to belong to the órchis genus; but this I mention with great diffidence, and only that you may attend to this particular in your inveſtigations of theſe extraordinary flowers.

Harr. When we have gathered orchiſes, we have frequently left the tway-blade, becauſe we thought its flowers not handſome; but we are now attentive to every thing that is like a plant, be it ever ſo ugly; and we often think of what you always ſay, mamma, that there is no ſuch thing as an ugly flower.

Hortenſ. I am really of that opinion, and extend it to every product of nature, that we make the ſubject of our thoughts; it is to thoſe who obſerve only with their eyes, that any of her works can appear ugly, or even indifferent. How often have you paſſed the leóntodon taráxacum, dandelion, as a flower of no beauty; now you are acquainted with the

the mechaniſm of its fructification, I dare ſay you have more reſpect for it.

Harr. Indeed I have. On the firſt view of the plant my mind is filled with the idea of its florets, its ſeeds with their down, and all the curious opening and ſhutting of its calyx: ſo that I have not a thought of its clumſy yellow flower, which before I underſtood the parts it was compoſed of, I did not like.

Henry. And I juſt now ſaw a ſpider on the window, and my finger was out, ready to ſtop it; but I thought, poor little thing, you have a great deal of work to do, I will neither frighten you, nor hinder you.

Hortenſ. Thus it muſt ever happen to reflecting minds; the more we exert our powers of thinking, the more we lay up ſtore for our own happineſs, and for the benefit of others. The inveſtigation of the órchis tribe has occupied us ſo long, that we will defer the conſideration of the árum till to-morrow, when you had better bring ſome freſh ones, as its flowers have a very offenſive ſmell, if kept more than two or three hours.

DIALOGUE THE THIRD,

Inveſtigation of different Génera of the Claſſes One-houſe, and Two-houſes, of Ferns.

Jul. We have brought ſeveral flowers of the árum. Pray, mamma, look how different the colours of the tongue are; here is one yellowiſh green, and another deep purple, the leaves and hoods too, are ſome ſpotted, and ſome plain.

Hortenſ. This plant is ſubject to great variety in theſe particulars; alſo in the ſhape of its leaves, perhaps the colour, of what you call the tongue, may in ſome degree depend on the different ſtate of ripeneſs in which you gather it. This is a wonderful flower, and ſeems intended by nature to ſhew us, that ſhe is not confined to any one method of renewing her productions. Here are berries produced with perfect ſeeds, which germinate and continue the ſpecies, as certainly as thoſe ſeeds formed in plants, which we call of a more natural ſtructure, becauſe they are of one more common: I have taken out the club-ſhaped receptacle, which you call the tongue, and ſeparated the ſpathe

carefully from it. You will find an advantage in referring to the plate of this plant, though not ſo neceſſary as in examining the orchis tribe. All other known plants have their piſtils placed within the ſtamens. In the árum the ſtamens are ſituated rather more inward than the piſtils, and above them on the receptacle. Theſe ſtamens are not raiſed by filaments, but are a collection of anthers four-cornered, and growing to the club-form receptacle; above and below theſe anthers are placed ſeveral roundiſh bodies, terminated by a tapering thread, theſe Linneus calls the nectaries. Beneath the lower order of nectaries, the ſeed-buds are placed, ſurrounding the baſe of the ſpadix, or tongue, of an oval ſhape, without ſtyles, and their ſtigmas bearded with ſoft hairs. Theſe ſeed buds become berries of a beautiful bright ſcarlet colour, correſponding in number with the germs; are round and have one cavity. I mentioned an opinion of the younger Linneus, when firſt we conſidered the claſs gynandria, that the arum did not properly belong to that claſs, but ſhould be placed in the claſs one-houſe, as every anther and ſtigma were rather to be eſteemed diſtinct

florets,

florets, than as belonging to one common flower. I incline to this opinion myſelf, but do not venture to remove it from the claſs, in which it is at preſent placed, till farther obſervations of reſpectable botaniſts have determined more decidedly its proper ſituation. The root of this árum is extremely acrid; but that property does not prevent its being dug up and eaten by the thruſhes. Some ſpecies have their roots ſo mild as to make a part of the food of the inhabitants of the hot countries, where they grow; and ſome of the ſorts are cultivated by the inhabitants of the South Sea iſles, and of the ſugar colonies, as eſculent plants. The leaves of one of the ſpecies, called indian cale, are boiled to ſupply the want of other greens. The roots of the árum maculatum, which is the ſpecies that we are examining, were formerly uſed for ſtarch; Gerrard mentions it having been ſo, and adds, that it was ſo extremely acrid, that the people who made uſe of it had their hands ſo much chapped, that they were healed with difficulty.

Charles. I remember once biting the leaves, and my tongue was ſore for ſome time afterwards.

Hortenſ.

Hortenſ. The whole plant abounds with an acrid juice. You ſhould be cautious of putting any parts of plants into your mouths; thoughtleſſneſs in this particular has ſometimes been attended with dangerous conſequences. Have you diſcovered the genus of that plant in the china jar?

Harr. We think it is mercuriális.

Hortenſ. You are right; it is the mercuriális perennis, and is a good ſpecimen of the claſs two-houſes. It is an elegant plant; its yellow ſtamens, and tender green leaves, are a great ornament to the hedge-banks, while it continues in flower. Neither the male or female flowers have corols. In the latter, the nectary is formed of two ſmall pointed filaments, placed on each ſide of the germ, and preſſed into the furrows of it. The other plant, which you have laid with ſo much care into that deep diſh of water, is one of the chief beauties of my aquatic garden. You have not found much difficulty in arranging that under its proper genus.

Charles. We ſuppoſe it to be the hydrócharis, or the frogs-bêt; but there are ſome appearances about it, that we hope to hear explained by you.

Hortenſ.

Hortenſ. The leaves, the whole ſtructure, and economy of this plant are exceedingly curious, and deſerve minute attention. Which are the parts that you do not underſtand?

Charles. It is an appendage of the ſtamens, which we thought might be a piſtil, but we could not diſcover any thing like either a ſtigma or germ.

Hortenſ. The male flowers of the hydrócharis have nine ſtamens, diſpoſed in three rows. The filaments of the middlemoſt row put out from their baſe, on the inſide, a ſtyle-like ſubſtance, which is placed in the centre of the flower. The two other rows are connected at the bottom, ſo that the internal and external filament adhere together. The anthers are yellow, nearly linear, and have two cavities. Linneus does not take notice of the nectary, but Mr. Curtis has obſerved in the female flower, three yellow glands crowning the germ, to which he gives that name.

Charles. Thank you, ma'am. I am glad to find that there was ſomething really curious in the appearance that puzzled us. We admire

admire the ſpathes of the flowers; they are ſomewhat like ſea-wrack.

Hortenſ. Theſe buds, from their tranſparency, have the appearance of bubbles; and are, you ſee, very numerous, both in the male and female plants, and chiefly grow near the root. In the male, there are alſo a pair of theſe ſpathes, which grow out about the middle of the flower-ſtalk, and look like little bladders, containing the tender unopened flowers. Mr. Curtis differs from Linneus in deſcribing the female flowers as encloſed by a ſpathe, which contains only one flower, that of the male three or four. The water plants ſeem to have engaged your attention particularly this morning.

Harr. Charles gathered theſe ſpikes of cat's-tail, but we could not make any thing of them.

Hortenſ. They are the greater and leſſer typha. Their flowers conſiſting of very minute parts, are difficult of inveſtigation; Mr. Curtis's account of them ſomewhat differs from that of Linneus, and is to be preferred; as he examined all the parts accurately with a microſcope. Theſe plants are of the one-

houſe-

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EXPLANATION OF PLATE II. PART II.

HYDROCHARIS MORSUS-RANÆ, FROGS-BIT.

Fig. 1. A Plant of Hydrócharis Morſus-ranæ, Frogs-bit, to ſhew its outer habits and mode of growing. *a*, *b*, Tranſparent Sheaths, containing Flower-buds.

Fig. 2. A Female Flower with the Germ, *c*.

Hydrócharis Morſus-ranæ.

Fig. 1.

Fig. 2.

Fig. 4.

Fig. 3.

Fig. 6.

Fig. 5.

Fig. 7.

Fig. 8.

Fig. 9.

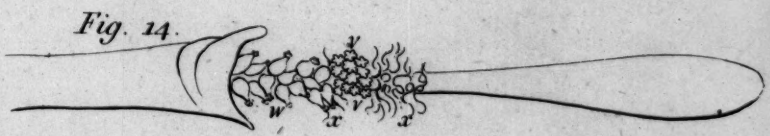
Fig. 13.

Fig. 12.

Fig. 11.

Fig. 10.

Fig. 14.



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EXPLANATION OF PLATE III. PART II.

FRUCTIFICATIONS OF FERNS.

Fig. 1. Part of a Plant of Pilulária Globulífera, Pepper-graſs, to ſhew the radical fructification of Fern, *a*, *a*, *a*.

Fig. 2. Spiked fructification of Fern, ſhewn in Equiſétum Sylváticum, Wood Horſe-tail, the Spike of the natural ſize, beginning to diſperſe its ſeeds.

Fig. 3. One of the Targets ſeparated from the Spike, and highly magnified; termed, by Hedwig, a Capſule-bearing Target.

Fig. 4. A Seed with its Stamens highly magnified.

Fig. 5. A Seed-bud with the Stamens rolled round it, before expanſion.

Fig. 6. Part of a leaf of Aſplénium Scolopéndrium, Hart's-tongue, to ſhew the leafy fructification of Ferns. *i*, An Involucre, or bag containing Seeds, not fully expanded. *k*, An Involucre expanded, ſhewing the Capſules.

Fig. 7. The Capſules in a magnified ſtate, each ſurrounded by an elaſtic ring, and having one cavity.

Fig. 8. A Capſule burſt open, diſcharging its ſeeds.

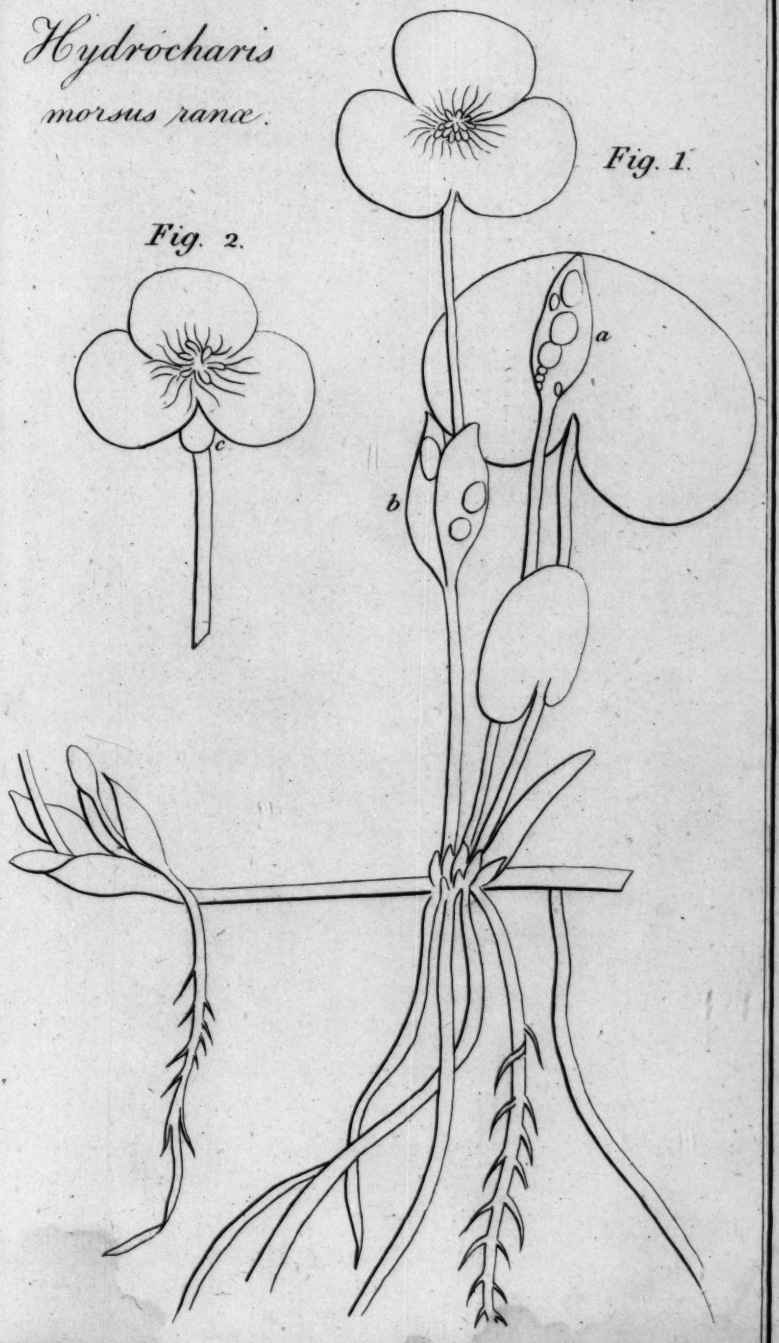
Fig. 9. The Seeds magnified.

Fig. 10. A Leaf of Fúcus Veſículous, to ſhew the growth of one leaf out of another. See page 101, ſecond part.

Hydrocharis
morsus ranæ.

Fig. 1.

Fig. 2.



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houſe-claſs, and by Linneus are placed in the order three-ſtamens; but as on one filament are found one, two, three, or four anthers, it ſeems that they might more properly have been arranged in that of polyándria, or many-ſtamens. What Linneus has called the calyx, from Mr. Curtis's obſervations, does not appear to be one, but rather ſome hairs proceeding from the receptacle, which is covered by them after the ſtamens are fallen off. Theſe ſpikes of flowers are aments, or catkins, and their cylindric form marks the eſſential character of the genus. The male flowers are numerous, and terminate the *culm*, which is the term that Linneus gives to the ſtraw of graſſes, and theſe reed-like plants. The female flowers are alſo numerous, and entirely ſurround the culm. The ty'pha major, when its ſpike of ſtamens is nearly ripe, makes a magnificent appearance, indeed every part of this plant deſerves attention: the root derives much beauty from its fine moſs-like fibres, and the ſhades of brown and green, with which the upper part is varied.

Charles. A part of it grows out of the

ground, and is very beautiful. Here is another plant, about which we have not ſatisfied ourſelves.

Hortenſ. This is a cárex, one of a numerous tribe of plants, the ſpecies of which it is not eaſy to diſtinguiſh: this however may be known directly. As to the cárex péndula, for in whatever ſituation it is found, it is diſtinctly marked by its long pendant female ſpikes. Theſe are very ſlender, when young, but become much thicker as the ſeeds ripen. Its fructification merits examination, as indeed does that of the catkin tribe in general, the inveſtigation of which is not a difficult matter, when a proper method is once attained.

Harr. I think I ſhall not again be at a loſs how to examine theſe plants. I perceive we muſt diſſect the ſeparate florets, as we do thoſe of willow and hazle.

Hortenſ. That is the only way; and after you have obſerved it in a few génera, the tribe of catkin plants will no longer perplex you; you will as readily refer a ty'pha, or cárex, to its proper genus, as you have done a crócus. We will now endeavour to attain

attain ſome idea of the ſtructure of the cryptogámia plants, and begin with the fílices, or ferns.

Jul. I am glad of that, for I wiſh to know ſomething of the little brown ſpots on the back of their leaves.

Hortenſ. Thoſe little brown ſpots are a moſt important part of the plants belonging to the fern tribe; and their wonderful conſtruction will well repay your trouble in the examination of them. The plants contained in the claſs cryptogamia have not yet been obſerved to bear either ſtamens or piſtils, therefore when their fructification is ſpoken of, you muſt confine your ideas to the ſeed only, and the apparatus by which it is contained and diſperſed. The whole tribe of the fílices, or ferns, are divided into three ſections, from the manner in which their fructifications are diſpoſed. The firſt diviſion conſiſts of ſuch as have their fruit in ſpikes; the ſecond, of thoſe which have it placed on the under ſide of their leaves; and the third, of what is termed by Linneus radical fructification, a ſpecimen of which is well ſeen in the pepper graſs (pilulária). The botanical world is much indebted to the ac-

curate reſearches of Hedwig, for many important diſcoveries in the obſcure families of plants belonging to cryptogamia: of the ſpiked fructification we cannot examine a better ſpecimen than the equiſétum ſylvaticum, at the time when it is beginning to diſperſe its ſeeds; in the progreſs of which there may be obſerved appearances, which ſeem to have a right to be conſidered as ſtamens and piſtils. In our inveſtigation of theſe plants, we muſt have recourſe to the microſcope; but you will find it more agreeable to view the parts through that glaſs, when you have attained ſome idea of their ſtructure from the plate before us.

Harr. I would much rather ſtudy the plates, before we begin with the microſcope; for I am ſure that I ſhall then underſtand better what I ſee through it.

Hortenſ. I think you will; but always remember, that in examining plates, you take the authority of others; whereas in botany, as in all other things, we can make little progreſs, if we do not ſee for ourſelves.

Harr. If when I look through the microſcope, I ſhould ſee any thing different from what Hedwig, or Mr. Curtis deſcribes,

ſcribes, I ſhall be certain that I am wrong, and they right.

Hortenſ. With due limitations, that is a proper way of thinking; but in ſuch caſes accuſtom yourſelf to ſtate in writing the particulars, in which you differ in your obſervations, from what you have heard or read upon the ſubject. You will by this means ſecure the benefit of being better informed, if you are miſtaken, and it may happen, that you may be right; and then you will have the pleaſure and honour of improving by your inveſtigations this moſt agreeable ſcience of botany.

Harr. But, mamma, it is not likely that great and wiſe men, who have ſtudied botany all their lives with every advantage ſhould be miſtaken.

Hortenſ. I grant you, that it is much more likely, that you ſhould be ſo; but as we do not unfrequently ſee great and wiſe men err in their judgment and accounts of things, we muſt not rely upon them as infallible: in whatever you undertake, make it a rule to *ſee for yourſelf.* It is the obſervance of this rule, that has rendered the works of Mr. Curtis ſo valuable. Moſt of our botanical

publications are taken one from the other; and thus if an eminent botaniſt has in the courſe of his reſearches fallen into a miſtake, the error has been propagated. Mr. Curtis from his caution in this particular has done more towards the improvement of the ſcience, than any other writer with whom I am acquainted; and by his judicious and candid correction of the few errors in the works of Linneus has rendered eſſential ſervice to the botanical world.

Harr. I will take your advice, ma'am; and when I have any doubts of what I read or hear upon the ſubject, I will write them down, or make them known to you; but if I had not you to apply to, I ſhould be at a loſs.

Hortenſ. A queſtion well and modeſtly put can never be impertinent, if not obtruded at an improper time; and you will always find it thought leaſt ſo by thoſe, who are moſt able to anſwer it. But we will begin with our equiſétum: early in the ſpring this plant puſhes out of the earth a little club-ſhaped head; round this head are placed in circles target-form ſubſtances, each ſupported on a pedicle, and compreſſed into angles, in con-

conſequence of their reſting againſt each other before the ſpike expands. Beneath each of theſe targets are from four to ſeven conical ſubſtances, with their points leaning a little inwards towards the pedicle. They open on the inner ſide, and on ſhaking them over a piece of paper, a greeniſh powdery maſs falls out, which at firſt is full of motion, but ſoon after looks like cotton or tow. All this we may ſee without a microſcope; but by the aſſiſtance of glaſſes green oval bodies have been diſcovered, and attached to them (generally) four pellucid and very ſlender threads, ſpoon-form, at their ends, as you ſee in the plate.

Jul. I ſhould not have ſuſpected, that thoſe little woolly bits of ſtuff had been ſo regularly and diſtinctly formed.

Hortenſ. We may always be ſure, that a nice and regular organization exiſts in all the various parts of plants, though from the want of a proper method of inveſtigating them this may not be always viſible to us. Theſe pellucid threads are almoſt conſtantly in motion, and are ſaid to contract themſelves upon the leaſt breath of moiſt air, and, when wet

with water, to roll round the green oval, from which they proceed.

Henry. I ſhall like to ſee this.

Hortenſ. To do ſo, I am afraid requires greater magnifying powers, than we are yet able to manage; therefore at preſent we muſt content ourſelves with taking this curious hiſtory upon truſt. Hedwig makes no doubt that theſe green oval bodies are the ſeeds, as they gradually increaſe in bulk, and when they fall the ſpike ſhrivels; that the projecting ſpikes are the ſtigmas, and the conical ſubſtances under the targets are the capſules, and the pellucid threads, with the ſpoon-form ſubſtances attached to them, the filaments and ſtamens; the ſeeds are numerous, egg-form, or globular, placed upon and lapped up within the filaments of the ſtamens. Future obſervations muſt confirm or refute this opinion. The different appearance of the ſuppoſed ſeeds, with their ſtamens, before the burſting of the anthers and afterwards, ſeems to be ſtrongly in its favour. The ſcales, or ſtipules, which ſurround the flowering ſtalk at certain diſtances after its protruſion, ſerved, whilſt it was young, as a general fence to the

ſpikes,

ſpikes. From your inveſtigation of equiſétum, you muſt have gained a clear idea of the form, in which its fructification appears, and thence of that which may be found in the reſt of the génera, which are arranged in the ſpiked diviſion of ferns. We now come to that, which contains the leafy fructifications, or the little brown ſpots, which have ſo much attracted Juliette's attention.

Jul. Then, mamma, ſhall we examine the maiden-hair? Shall I bring a pot of it out of the hot-houſe?

Hortenſ. Its purple ſtalks, and ſcollopped green leaves, dotted with brown underneath, are very beautiful. We may boaſt of this elegant plant as a native of England: the ſyrup of capillare, of which you are ſo fond, derives its name from the botanical appellation of your little favourite, adiánthum, capillus veneris, or venus's hair, and is ſuppoſed to be in part compoſed of it, though I believe it is chiefly made from ſugar and water: the parts of fructification are too minute for our preſent purpoſe. This hart's-tongue, aſplénium ſcolopendrium, from its ſize, will ſhew the fructification more diſtinctly; the firſt appearances of which, that

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can be obſerved, are ſome little bags, or caſes of a yellowiſh or whitiſh green colour, placed in rows on the under ſide of the leaves; if theſe are opened, almoſt as ſoon as they become viſible, there will be found capſules, or ſeed-veſſels, very numerous, ſtanding upright, and cloſe together. At this time they appear to be of a green colour; as they approach towards maturity, they change this for a dark brown; at which period the caſes open lengthways in the middle, and by the protruſion of the capſules, the two ſides are turned quite back, and wholly diſappear; this membranous ſubſtance may be conſidered as the ſame with the calyx in other plants, and ſerves to defend the tender capſules with their ſeed till ripe, when their curious mechaniſm ſtrikes us with grateful aſtoniſhment at the benevolent and adequate care, that nature takes of the minuteſt of her works. Each capſule conſiſts of three parts, the foot-ſtalk, which ſupports and connects them to the leaf, as you ſee in the plate, and the jointed ſpring, which nearly ſurrounds the third part, or cavity containing the ſeeds. The ſeeds being ripe, this cavity is forced open by the elaſticity of the jointed ſpring,

and

and the ſeeds ſcattered and thrown to a conſiderable diſtance, one half of the cavity remains connected to one end of the ſpring, and the other half to the other end.

Henry. It looks in the plate like a little box. Though we admired theſe brown ſpots, Juliette, we did not know any thing of all this.

Jul. No, indeed; we never thought of the apparatus they contained; we knew they were ſeeds; mamma had told us ſo, but I ſuppoſed them like ſtock ſeeds; but then, you know, we were ignorant of the parts of fructification. If there are ſeeds on a plant, we may gueſs there is generally ſomething more.

Hortenſ. You will ſeldom find yourſelves miſtaken. Theſe capſules are an agreeable ſubject for the microſcope, but it is difficult to manage them, ſo as to gain a diſtinct idea of their progreſs. They are placed ſo cloſely together on the leaf, that it is neceſſary to ſeparate them from it with a fine knife, before you begin to view them, otherwiſe there appears only confuſion. The warmth of the breath alſo, by occaſioning the capſules to open and diſcharge their ſeeds, gives them the

the appearance of ſomething alive. While you are intently looking at one, hoping to obſerve the operation, the ſtrength and elaſticity of the ſpring, at the moment of diſcharging, will often carry it out of ſight, ſo that to ſee the manner of opening requires ſome dextrous management, and much patience; but we ſhall be able, I dare ſay, to overcome the difficulties, and obtain the amuſement of viewing through the microſcope this curious arrangement.

Charles. Mr. Wilſon promiſed to ſhew me the wonderful mechaniſm of the ſeeds of fern, when we had entered upon the inveſtigation of them with you.

Hortenſ. Very well; we will then invite Mr. Wilſon to our afternoon party, with Juliette and Henry's pupil, Mrs. Pratt; and we will ſpend it in amuſing ourſelves with the microſcope.

Henry. Mrs. Pratt will like that, for ſhe is quite fond of botany, and always wants a new leſſon.

Hortenſ. She is very good to you, and we muſt do every thing we can to amuſe her. We will examine this ſpecies of fern, the polypódium vulgare. Obſerve its root, which re-

reſembles as nearly one of the very large kind of caterpillars, as that of the polypódium barometz, if we may judge from the prints of it, does a ſheep! This plant is deſcribed by many eminent botaniſts, as being deficient in the elaſtic ring, which furrounds the capſules, and by means of which they are burſt open, and their ſeeds diſcharged. It would be extraordinary to find any of the fern tribe deſtitute of this ſeemingly eſſential part; neither has it yet been diſcovered, that they are ſo, by the accurate and diligent reſearches of Mr. Curtis, who aſcribes this error of deſcription to the blindly following the authority of figures; for had thoſe authors, who have falſely characterized the polypódium vulgare, from its want of the elaſtic ring, made uſe of their own eyes, aſſiſted only by a common magnifier, they muſt have ſeen, what had long before their time attracted the notice of enquiring botaniſts. At the ſame time it is not eaſy to account for the error of the ingenious tournefort, who has delineated the capſules of the genus polypódium without rings; but this is one of the many inſtances, which ought to deter us from relying upon authority, be it

ever

ever ſo reſpectable. There is one circumſtance attending this polypódium, which does not run through the whole genus, that is the want of the membrane, which in the reſt of the family, is found encloſing the capſules; of this however it may not be deſtitute, but it may have eſcaped notice from early falling off, when the capſules are arrived at a certain degree of maturity. This tribe of plants not having been much attended to leaves to modern botaniſts an ample field of diſcovery; and I flatter myſelf it is reſerved for you, Charles and Henry, to diſtinguiſh yourſelves in it.

Charles. And why not my ſiſters, ma'am; I am ſure they generally go before us in whatever we learn together.

Hortenſ. I do not doubt their abilities; and would have them as thoroughly informed upon the ſubjects that they ſtudy, as I wiſh you to be; but to avoid obtruding their knowledge upon the public. The world have agreed to condemn women to the exerciſe of their fingers, in preference to that of their heads; and a woman rarely does herſelf credit by coming forward as a literary character. The world improves, and con-

conſequently female education. Some years ago a lady was aſhamed to ſpell with accuracy; happily the matter is now reverſed, and the time will come, when it muſt be granted, that by improving our underſtandings, we enlarge our view of things in general; and thence are better qualified for the exerciſe of thoſe domeſtic occupations, which we ought never to loſe ſight of, as our brighteſt ornament, when properly fulfilled. At this time information in a woman, beyond a certain degree, diſtinguiſhes her above her companions, and like all other diſtinctions is liable to lead her into a vain diſplay, of what ſhe hopes will gain her admiration. Hence ſhe becomes ridiculous, and brings, what in itſelf might be a credit, into a diſgrace; whereas the diſgrace ought to fall only on herſelf, and not ſtamp ridicule upon thoſe of better underſtandings, who extend the advantages of their education to every occupation of life.

Harr. If we make an ill uſe of the education you give us, we ſhall indeed deſerve blame.

Hortenſ. I have no reaſon to fear your doing ſo; and indeed the danger decreaſes to every generation. The ſubject of education

is much thought upon, and young people in general are well informed; when their being ſo ceaſes to be a novelty, there will be no longer place for pride in thoſe who have knowledge, nor for envy in thoſe who have none; as there will be no particular object to excite either ſpleen or admiration. You have, I think, attained a tolerably clear idea of the fructification of ferns; practice and attention can alone make you familiar with the different génera, an undertaking in which there is much difficulty. So great a ſimilarity runs through the fructifications of them all, that the diſtinction cannot be founded on that part of the plant. The various modes, in which the capſules are placed on the Frond, or leaf, in ſome of them are ſtrikingly different, and appear to form very diſtinct and ſatisfactory characters; but when as a tribe, they come to be more minutely inveſtigated, the characters of one are frequently loſt in thoſe of another, and we in vain ſeek for a preciſe generic character. The plates and remarks in Mr. Curtis's London Flora are particularly pleaſing and uſeful on this ſubject. The elegance of the figures of ſome of the génera is ſcarcely exceeded by their natural

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appearance: you will find that the roots of the oſmúnda ſpicant, given by Mr. Curtis, have the ſame reſemblance to a large caterpillar, that the root of the polypódium vulgare has.

Harr. That polypódium is a great ornament to your favourite ſtump of oak, mamma, at the park gate.

Hortenſ. Wherever the ferns are found, they are ornamental; on walls, old wells, and banks in winter, they make a principal feature in that beautiful aſſemblage of the cryptogamia plants, which may be ſaid to form a winter garden; and this they do, with ſo much greater elegance ſpontaneouſly, than can be effected by art, that I only collect the different families, and leave them to group themſelves, which they have done in the moſt advantageous manner on the heath-bank on the outſide of the park pale. I will walk with you thither, and we will return through the wood, and gather ſome moſſes for our inveſtigation to-morrow.

DIALOGUE THE FOURTH.

On the Moſſes, Flags, and Funguſes; Muſci, Algæ, and Fungi.

Hortenſ. We are now to enter upon a tribe of plants, little underſtood, but which from their beauty and uſefulneſs in the vegetable kingdom deſerve every reſpect and attention. The beauty of their leaves is too obvious to require any explanation; but many are ſo inſenſible to their uſe, as to ſuppoſe that they impoveriſh the ground on which they grow: this is by no means the caſe; they thrive beſt in barren places, and love cold and moiſture, and hence cover thoſe lands with verdure, which would otherwiſe remain bare: ſo far from injuring the plants, which are found intermingled with them, they afford them protection; their own roots penetrating to ſo ſmall a depth into the ground, that they take from it little nouriſhment; wherever a ſmall quantity of graſs is found with moſſes, there would be none without them; and if the land is drained and manured, it will be ſeen that the moſs is no impediment to the growth of the graſs; for it ſoon diſappears, and the graſs flouriſhes; a yet more eſſential uſe is derived

derived from various ſpecies of moſs, which grow upon the ſides, and ſhallow parts of pools and marſhes; in proceſs of time their roots occupy the ſpace, which was before filled with water, and in their half-decayed ſtate are dug up, and uſed for fuel, under the name of peat; of the importance of which you cannot be duly ſenſible, as you enjoy plenty of the beſt coal. It is not however from moſs alone that peat is derived; ſo that we muſt only give it a ſhare of praiſe among other vegetables, ſeveral of which, even whole trees, form the compoſition of peat beds. You have found the benefit of covering young plants with moſs, as by doing ſo, you have frequently preſerved them from froſt and burning heat; it retains moiſture a long time, without putrefying, and from that property is of great uſe in packing plants, that are to be ſent to a diſtance.

Henry. I often ſee the gardener put moſs about grafted trees; and he tells me, that it prevents their drying too faſt.

Hortenſ. That is owing to its power of retaining moiſture; whilſt the moſs continues damp, it prevents the juices of the graft from evaporating. Since the time of Linneus it has

been well eſtabliſhed, that the muſci, or moſſes, have diſtinct fructifications, though botaniſts are yet divided in regard to their ſituation; but as theſe plants now have excited general attention, a few years will give us, I hope, a reviſal of the works of Linneus, with the improved knowledge derived from modern inveſtigation: already an improvement in the claſs Cryptogamia has, I believe, been attempted and received; which encourages us to hope, we may ſee at no very diſtant period, that diviſion of extraordinary plants no longer a reproach to the ſcience. At preſent, the outer habits, and ſituation as to the growth of the flowers or capſules, are chiefly made uſe of to diſtinguiſh the génera of moſſes. Theſe plants reſemble pines, firs, and other ever-greens of that tribe, in the form and diſpoſition of their leaves, and manner of growth of their ſeed-bearing flowers, which are generally formed into a cone; moſt of the moſſes are perennial and evergreen; their growth is remarkably ſlow; their anthers, from their firſt appearance to the time of the diſperſion of their powder, continue from four to ſix months. In ſome of the ſpecies the leaves are ſmall and undivided,

divided, and have no viſible foot-ſtalk, or mid-rib; in others, as in hy'pnum proliferum, they reſemble the fronds of ferns. Their ſtamen and ſeed-bearing flowers are ſuppoſed to be placed apart; ſometimes on the ſame, and ſometimes on different plants. The calyx, termed by Linneus the calyptre, covers the tops of what he called the ſtamens. From the preſence or abſence of this cover, which falls before the opening of the ſuppoſed anthers, Linneus, after Dillenius, has diſtinguiſhed the genera. After the veil, or calyptre, is taken off, there is found another cover to the anthers, which Linneus calls the operculum, or lid. This is a beautiful microſcopic object; but you muſt be content to become acquainted with it, and the other parts of fructification of the moſſes, firſt by the aſſiſtance of plates, and afterwards amuſe yourſelves with viewing them through glaſſes.

Harr. We are all, I dare ſay, Ma'am, very content to proceed as you think beſt. We learn daily to ſee with our naked eyes beauties in the moſt common plants, of which laſt year we were no leſs inſenſible than if we had been blind.

Hortenſ. The eye of the body will not carry us far, unleſs aſſiſted by that of the mind.---Before the parts of fructification are protruded, they may be ſeen by the aſſiſtance of powerful magnifiers incloſed within thoſe ſmall buds, which terminate the leaves of moſſes, and have the appearance of being only a continuation of them. Hedwig diſcovered, that the leaves, or ſcales, compoſing theſe buds differed materially from the leaves of the plant, and conſiders them as true involucres to the parts of fructification. He has alſo obſerved, that in the capſule-bearing moſſes, which have their cones ſituated towards their extremities, the leaves adjoining the fruit-ſtalk are much more beautiful than thoſe of the ſtems. Sometimes the inner leaves become gradually ſmaller, and thoſe neareſt the fructification ſo very minute as to make it impoſſible to take them away without a microſcope. Theſe involucres, like the calyxes of many other well-known plants, grow larger as the capſules advance towards maturity. Hedwig gives ſo minute and particular an account of both the ſtamen and ſeed-bearing flowers of the whole family of moſſes, that, if he has not been deceived in his reſearches, we may expect

pect ſoon to ſee a greater progreſs made in the knowledge of this difficult tribe of plants, than ſome years ago it appeared probable would ever be attained; but as theſe reſearches were made by the aſſiſtance of the moſt powerful magnifiers, and with every advantage that could be procured, I do not think you will at preſent gain much information in regard to the natural plant by ſtudying his plates. Mr. Curtis's deſcriptions and figures will immediately make you well acquainted with every ſpecies, that he has delineated. We will therefore, if you pleaſe, examine one or two of the ſpecimens he gives, and will begin with the bry'um undulatum, or curled bry'um, which he recommends to the notice of young ſtudents, as it's parts of fructification are large and diſtinct.

Juliette. I am glad we are not to leave Mr. Curtis, he makes every thing ſo plain to me.

Hortenſ. In regard to the moſſes, he does not pretend to decide the queſtion, whether the powder, from what is called the capſule, is the anther-duſt or ſeed. Hedwig aſſerts, that theſe capſules are true ſeed-veſſels, and

tells us, he ſowed them, and repeatedly procured from them a crop of young plants, ſimilar in all reſpects to the parent plant.—Dillenius ſowed theſe cones frequently, but without ſucceſs: it is probable that the ſituation of the ſtamens and piſtils under one or diſtinct covers may have occaſioned ſuch different reſults from the experiments of theſe eminent botaniſts. When you are well acquainted with the ſtructure of the parts of theſe curious vegetables, you may reaſon upon the various opinions, which have been entertained of their uſe.—In the curled bryum, the capſules or anthers are cylindrical, bent inward, and if magnified, they appear ſomewhat ſtriated. Their colour is firſt green, then livid brown, and laſtly of a reddiſh brown colour. The bottom of the opérculum, or lid, is convex and red; the top paler, very ſlender, and rather blunt; the mouth of the capſule is fringed, and the fringe bent inward; the ring is red, and the powder, which iſſues from the capſule, be it ſeed, or anther-duſt, is green. Hedwig has obſerved, that this fringe of the capſule in dry weather expands, and leaves the mouth of it open; but on the leaſt moiſture, even of the breath,

it

it cloſes again. He remarks, the ring of the capſule of ſome ſpecies is elaſtic; and, when the ſeed is ripe, throws off the veil with more or leſs force; and it is after this veil, or calyptre, is gone, that the fringe ſerves to protect the precious contents of the capſule. The calyptre in bry'um undulatum is of a pale brown colour, terminating in a long point, firſt upright, but afterwards, on the bending of the capſule, it becomes burſt at bottom, and remains ſtrait, with it's baſe at ſome little diſtance from the capſule. * We will now look at the plate, where we ſhall ſee all theſe curioſities well and elegantly delineated.

Charles. I do not know whether to admire moſt, the mechaniſm of the fructification of the moſſes, or that of the ferns.

Hortenſ. They both ſeem deſtined for the formation, protection, and diſperſion of their ſeeds, or of ſome ſubſtance equivalent to it; but, unleſs we credit the plates of Hedwig, we are equally ignorant of the manner in which this ſeed is produced in both tribes. In

* A plate is given of the different parts of moſſes, for thoſe who have not the advantage of conſulting Mr. Curtis's London Flora.

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the magnified leaf of the bry'um undulátum you ſee the circumſtance, which has given it's ſpecific name, the leaf being waved at the edge. This moſs produces it's fructification from November to February, and is commonly to be found either in woods or on heaths; it's leaves ſoon curl up, after the plant is gathered; ſeldom more than two peduncles ariſe from one ſtem, generally only one; they are both longer than the ſtem, upright, and of a reddiſh colour.

Henry. I ſhall know this bryum, when I ſee it growing, I think; for the drawing is ſo like a real plant.

Hortenſ. Your beſt way of knowing it will be to gather a patch of it, and ſeparate the plants one from the other: while the moſſes are growing, you cannot obſerve the leaves diſtinctly.---We will examine another ſpecies of moſs, which Mr. Curtis has thought proper to refer to the bry'um genus, though placed by Linneus among the mníums. On the firſt view it is diſtinguiſhable from the bryum undulatum; it's bending peduncles, which have occaſioned it to be called the ſwan's-neck bryum, are an obvious character in this ſpecies; added to this, is the ſtar-like appear-

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ance, which terminates thoſe ſtems, from whence the capſules do not proceed: theſe ſtars are ſuppoſed by ſome authors to be the female parts of fructification. Mr. Curtis, with very accurate inveſtigation, was not able to diſcover any thing in their ſtructure, in the leaſt ſimilar to any of the parts of fructification in other plants. Hedwig aſſerts, that theſe ſtar-like appearances are the involucres of the ſtamen-bearing, or male flowers, and makes no doubt of the capſules containing the piſtils, or female flowers. If the ſtars and capſules are really diſtinct parts of the fructification, it ſeems to me probable, from the ſituation in which they grow, that the ſtars contain the females, and the capſules the males; but, if I may conjecture, who have not inveſtigated the ſubject, I ſhould ſuppoſe, that ſome of the génera of moſſes might have flowers of all kinds, like thoſe plants which compoſe the claſs polygamia. On this obſcure ſubject, I have thought it neceſſary to give you ſome idea of the opinions of different botaniſts, leſt, by ſhewing you only the deſcriptions of particular individuals, I might lead you to form too decided an opinion upon a point, which is not yet ſufficiently clear

clear to juſtify any thing further than conjecture.

Charles. Mr. Wilſon ſays, Hedwig has made it all clear, and that he is the only author to follow.

Hortenſ. On all unſettled points every ſyſtem has it's partiſans. The beſt method of judging of the fact, whether the ſtars found on ſeveral ſpecies of moſs contain the male or female flowers, is repeatedly to ſow them, and make accurate obſervations on the reſult; but we may find, that we miſlead ourſelves by too pertinacious an adherence to the enquiry after one mode of re-production; and that what we ſuppoſe to be ſeeds may partake more of the nature of buds, and that the moſſes, and other plants of the claſs Cryptogamia, may be viviparous only, and not oviparous, or producing young plants without ſeed. The moſs, that we have juſt now been conſidering, produces its ſuppoſed fructifications in February and March. This little moſs, which we find almoſt upon every bank beſet with capſules from September to February, is the bry'um trunculátum, or lopped bry'um, ſo called from the appearance of it's capſules, after the opérculum is fallen off; which

which having no fringed margin, ſeems to be cut acroſs: it is one of the leaſt of the moſſes, and diſtinguiſhable on firſt view by the great number of it's little brown heads. This plant is evidently diſtinguiſhed from the bryum viridulum, which in ſize and outer habit much reſembles it, by the difference in the figure of their capſules; thoſe of the bryum viridulum being in the form of an egg, after the opérculum is fallen off, and their mouths finely fringed; ſuch decided marks of diſtinction are particularly agreeable, when found in plants which in ſo many circumſtances reſemble each other; but we are not far enough advanced in the knowledge of the génera to enter deeply into ſpecific differences. I wiſh to give you ſome idea of the outer habits, and of the curious ſtructure of thoſe parts, which are ſuppoſed to be the fructifications of moſſes, and thence make you ready to underſtand them, though it is not now in my power to inform you on the ſubject as I wiſh.

Charles. From what you have ſhewed us, Ma'am, we ſhall be able to underſtand what we read upon the ſubject; and the knowledge I have gained about the capſules, makes me very deſirous to inveſtigate their true uſe.

Hortenſ.

Hortenſ. Regular experiment can alone enable you to make any important diſcoveries. We will examine two other kinds of moſs, and then you will have a pretty good idea of the parts, that you may expect to find in the various génera, of which they conſiſt; the one, that we are now about to conſider, is the hy'pnum prolíferum. The hy'pnum and bry'um families are ſeparated by Linneus from the ſituation of the peduncle, which ſupports, what he terms, the anthers, but which later writers have agreed to call the capſule. This in the bry'um grows out of the top of the ſtem, and is finiſhed at it's baſe with a little naked tubercle, or bulb. In the hypnum the peduncle grows out of the ſide of the ſtalk; and the tubercle at it's baſe is covered with leaves. This elegant ſpecies of hy'pnum derives it's ſpecific name, *proliferous*, from the ſingular ſtructure of it's leaves, or fronds; one large ſhoot proceeding from the middle of another repeatedly; and theſe ſhoots extending themſelves along the ground, and taking root. Linneus found this beautiful plant in one of his journies through Sweden, growing in the thickeſt woods, obſcured by per-

perpetual ſhade, and where no other plant could exiſt.

Charles. There is no appearance here of any thing like fructification, but in the capſules.

Hortenſ. Nor in many other moſſes. This plant is not often found in a ſtate of fructification, though by diligent ſearch it may be ſo. It's time of fructifying is from December to February. I do not know, whether it's capſules have ever been ſown. The ſtructure of the capſules will be found nearly the ſame in all the moſſes. Mr. Curtis has however diſcovered ſome peculiarities in thoſe of bry'um ſubulátum, or awled bryum, and in poly'trichum ſubrotundum, or dwarf poly'trichum, which are worthy of further attention. The bry'um, after it has loſt it's calyptre and operculum, protrudes from it's mouth a ſubſtance, which by magnifiers is found to conſiſt of a number of filaments, forming a thin ſpiral tube, looſe and unconnected at the top: this tube may be ſeen through the tranſparent opérculum, forming in it's young ſtate a ſmall ſpiral line. Mr. Curtis does not even conjecture, what may be the uſe of this extraordinary appendage; it may perhaps be the

receptacle of the ſeeds within the capſule, which on arriving at maturity burſts open the covers, and diſperſes it's contents; to aſcertain this, when you begin with experiments, you muſt ſow a great number of the capſules with, and without theſe tubes, and the tubes without the capſules.

Charles. The reſult of ſuch experiments would prove the uſe of theſe tubes directly, I ſuppoſe.

Hortenſ. Such experiments repeated may do ſo: but there would be great nicety required in the time of gathering theſe capſules; it is poſſible, that at the moment of protruſion the vegetating power may be loſt; therefore we ſhould not be too haſty in concluding, that it did not reſide in theſe filaments, becauſe we did not obtain young plants from them; or in ſowing the capſules, while their covers remained, without any produce, we ſhould not determine that they were incapable of making any, as they might not be in a ſtate ſufficiently mature.

Charles. I ſee that it is not an eaſy matter to make experiments; however, I will begin, and with your aſſiſtance, Ma'am, hope to manage them.

Hortenſ.

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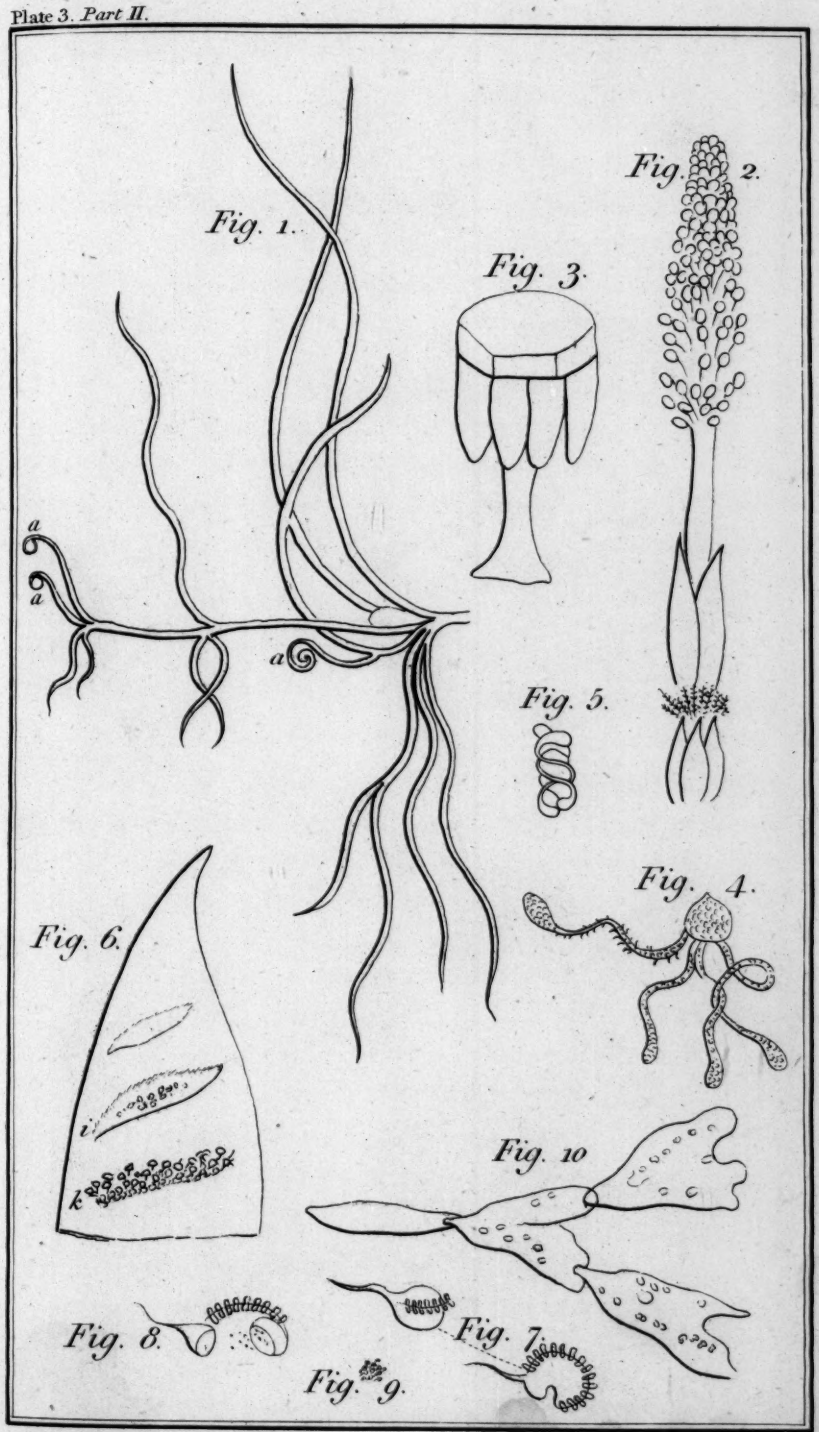
EXPLANATION OF PLATE IV. PART II.

FRUCTIFICATIONS OF MOSSES.

Fig. 1. A Plant of Bryum Undulátum of the natural ſize.
Fig. 2. The Capſule much magnified with its Calyptre.
Fig. 3. The Calyptre ſeparated from the Capſule.
Fig. 4. The fringed mouth of the Capſule.
Fig. 5. The Fringe, with the ring taken off the Capſule.
Fig. 6. The Opérculum of the Capſule.
Fig. 7. A magnified Leaf of Bryum Undulátum.
Fig. 8. A Plant of Bryum Hórnum, Swan's Neck Bryum, to ſhew the Roſe or Star which terminates ſome of the Leaf-ſtems, *a*.
Fig. 9. A Plant of Hypnum Prolíferum, to ſhew the manner of its leaves growing out of each other, and of the Capſules being placed on the Stem, *b*.
Fig. 10. A Leaf greatly magnified, to ſhew its granulated appearance.
Fig. 11. The Capſule with its Fringe. *c*, The Opérculum ſeparated from the Capſule.
Fig 12. The Fringe with its Ring, ſeparated from the Capſule.



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Hortenſ. There is no doubt of your doing ſo, if you apply your mind to it; and when once you have formed your method, you will not find it very difficult. We have now to obſerve the curious and beautiful ſtructure of the capſules of the poly'trichum ſub-rotundum, and which Mr. Curtis has found to be a conſtant character belonging to the genus, as far as he examined the ſpecies he could procure. The capſules of moſſes in general have only one veil or calyptre; in this genus there are two within the woolly calyptre of the poly'trichum, which has the appearance of a little diſtaff covered with flax, he found a membranous ſhining ſubſtance, cloſely connected by its top to the inſide of the woolly one, which is peculiar to this genus, but which was ſcarce viſible, except by totally inverting it; by doing ſo, it is viſible to the naked eye. This inner calyptre differs very little from that of other moſſes; at firſt it wholly ſurrounds the unripe capſules; as they increaſe in ſize, it ſplits at the bottom, and finally becomes very ſhort. We will here finiſh our inquiry in regard to the moſſes, and now proceed to the third order of the obſcure claſs cryptogamia, the algæ or flags.

Harr. If we find them as agreeable as the moſſes have been, we ſhall be very fortunate: the beauty and curioſity of their capſules, with their apparatus, have been very amuſing indeed.

Hortenſ. Their having proved ſo has detained us longer on their ſubject, than I had intended; that you have found the inveſtigation of them ſo particularly amuſing has been owing to Mr. Curtis's accurate and elegant plates: but, with the aſſiſtance of common figures, an account of his diſcoveries cannot fail to be an intereſting part of the ſtudy of botany; it is therefore to be wiſhed, that he would give the world a cheap edition of his inveſtigations of the cryptogamia plants, with unadorned, but accurate plates, as he has done of the moſt common graſſes, and by which he would greatly facilitate the endeavours of thoſe, who were deſirous of becoming acquainted with them; his London Flora being a work of too much expence to be of general utility; beſides, that by placing one tribe of plants together, they are more readily conſulted.

Juliette. I wiſh he would; Henry and I might then carry them out with us, and we ſhould

ſhould ſoon be acquainted with the crypto-gamia plants, that grow within the compaſs of our walks.

Hortenſ. You would, even with ſuch aſſiſtance, ſtill find it difficult to diſcriminate the ſpecies, if not the genera of theſe extraordinary vegetables, ſo nearly do many of them reſemble each other. There is a ſpecies of polytrichum, the piloſum, or ſmall hairy poly'trichum, which will be rendered intereſting to you, from a knowledge of its uſe, like the rein-deer moſs to the poor Laplanders; and this not through the medium of any other ſubſtance, but in it's own natural ſtate, as it is found growing.

Henry. What do they do with it?

Hortenſ. It ſerves them for beds, and that in a curious manner. When obliged to ſleep in deſert places, which not unfrequently happens, they mark out with a knife about two yards ſquare of the ground, where they find the poly'trichum pilóſum growing thick together; then, beginning at one corner, they gently ſever the turf from the ground; and as the roots of the moſs are cloſely interwoven, they by degrees ſtrip off the whole marked-out turf in one entire piece; then they mark

out and draw up another piece, exactly corresponding with the firſt; then, ſhaking them, they lay one upon the ground, with the moſs uppermoſt, and the other over it, with the moſs downwards; thus obtaining both a coverlet and ſoft matraſs, between which they ſleep with as much comfort, as we can do with all the numerous apparatus of a bed prepared for our repoſe.

Juliette. I ſhall be aſhamed ever to complain again, that my bed is not eaſy enough, when it happens not to be quite even.

Hortenſ. It would be well, if we made a point of improving ourſelves by the knowledge, that we gain of our ſuperiority over too many other countries. Such reflections, as you have juſt now made, muſt ariſe; but we ſuffer them to vaniſh again too haſtily. If we governed our actions by them, we ſhould increaſe the happineſs of ourſelves, and all around us.—We will now begin with the algæ: I am ſorry that we cannot have Mr. Curtis's aſſiſtance in that tribe of vegetables; but we ſhall return to him again, when we enter upon the fungi, or muſhrooms. The plants comprized under the deſcription of algæ, or flags, ſcarcely admit of a diſtinction

of

of root, ſtem, or leaf; much leſs are their flowers ſufficiently obvious to admit of a definition of their parts, though by the ſituation of their ſuppoſed flowers, or ſeeds, the genera are diſtinguiſhed, or ſometimes by the reſemblance of the whole plant to ſome other ſubſtance with which we are familiar in the economy of nature. This tribe of plants is of great importance, as they frequently afford the firſt foundation, from which other plants draw nouriſhment. One ſpecies of byſſus, and ſeveral ſpecies of lichen, fix upon the bareſt rocks, and are ſupported by what ſlender ſupply the air and rains afford them. Dr. Smith, in his tour on the continent, in the years 1786 and 1787, found near Mount Veſuvius, on a torrent of lava, which iſſued in 1771, the lichen paſchalis, which covered it moſt copiouſly, and had the appearance of hoar froſt, with no other plant near it. The lichen paſchalis is peculiarly fitted for the beginning of vegetation on the hard ſurface of lava, from its ſhrubby figure, and ſlender roots; in the ſame manner, the thread-form lichens inſinuate their roots into crevices in the bark of the oldeſt trees, while the broad cruſtaceous kinds cover young bark, and the

ſmoother ſorts of ſtones and rocks. The lichen paſchalis being a perennial of very ſlow growth, many years elapſe before it's crumbling branches fall into the cavities of the lava, and there decaying form vegetable mould for the nouriſhment of other plants. By attentive obſervation the progreſs, in which ſuch vegetable mould is formed, may be ſeen on the ſmooth and barren rocks upon the ſea-ſhore; and by a knowledge of the decaying plant we may know that, which will next ſucceed. After the byſſus and ſeveral ſpecies of lichen have crumbled into duſt, firſt appear other ſpecies of lichen, which require a deeper ſoil for their ſuſtenance. When theſe periſh, and have again more thickly covered the rocks with mould, various kinds of the moſſes appear; in their turn theſe alſo decay, when their places are ſupplied by other plants, till a ſufficiency of earth is accumulated to afford nouriſhment to the largeſt trees. I have before obſerved to you, that ſome of the ſpecies of lichen are uſed in dying; one of them, *lichen roſella*, called the orchel or argel, is brought from the Canary iſlands, and forms a conſiderable article of traffic; they are a grateful food to goats, as well as to the rein-deer.

Juliette.

Juliette. I think, mamma, you have told us, that what we call the cup-moſs, is a lichen.

Hortenſ. It is the lichen pyxidatus, or box lichen; there is great difficulty in aſcertaining the ſpecies or varieties of the numerous plants of this genus; according to Hedwig's inveſtigations their cup and ſaucer-like appearances, which are found on the various ſpecies of lichen, are to be eſteemed the ſeed-bearing flowers; and the notches, and warts with black tops, thoſe which contain the ſtamens: he aſſerts, that the fringes from the lichen ciliaris, fringed lichen, which take root, and the downy matter on the ſurface, have nothing to do with the real parts of fructification. He gives very particular accounts of theſe parts, with plates of ſeveral génera of the algæ tribe; but the whole of theſe plants is at preſent ſo little underſtood, that I do not know how to give you any information concerning them, that will be of advantage to you. The plant you call ſea-wrack is of the algæ tribe, and of the fúcus genus; it has it's ſpecific name of veſículous or bladdered, from the bladders which cover it's ſurface. If the leaves of this vegetable receive an injury or

fracture, if the plant be in a vigorous ſtate, abundance of young leaves are thrown out from the injured part, even if a ſmall aperture be made in the middle of a leaf, a new one ariſes from either ſide of it.

Henry. I ſhall like to obſerve this, when we go next to the ſea: I have gathered ſea-wrack, with tufts upon it, like black horſe-hair.

Hortenſ. Thoſe hair-like tufts are not any part of the fúcus, but are diſtinct vegetables of the conférva genus, which attach themſelves to the bladder fucus, and appear to belong to the plant itſelf. There are ſome ſpecies of fúcus which perhaps on further inveſtigation may be found to partake more of the animal, than of the vegetable kingdom, in the ſame manner as the ſea anemóne; which was believed, till lately, to belong to the latter. The green ſcum, which we ſee on ſtagnant water, and the green films on trees, are but juſt now beginning to be properly enquired into. In a courſe of years the whole claſs Cryptogamia muſt undergo a different arrangement; and I do not think, that any one of the four orders, of which it conſiſts, requires it more than that, which we have now under

under conſideration; neither can I find amongſt the genera contained in it a common character ſtrong enough to aſſemble ſuch a variety of families, which apparently differ in many ſtriking circumſtances: they all ſeem to poſſeſs peculiarities, which are well worthy of inveſtigation; the beauty of the lichens attracts our notice in winter on every tree, and bank, and wall, as they form a conſpicuous part of that elegant arrangement, which we always find in an aſſemblage of the cryptogamia families. That beautiful little plant, which you ſee on heaths, and which is commonly called white moſs, is the rein-deer lichen; a knowledge of it's uſe to the ſtarved inhabitants of the northern climates gives us an intereſt in it, beyond what neceſſarily ariſes from its elegance of ſtructure. There are many varieties of this plant, from which it is diſtinguiſhable by its very different appearance, even when found in the ſame places. The lichen ſylváticus, wood lichen, which is only a variety of the rangiferinus, has uniformly its branches of a reddiſh brown colour, and its ſtalks ſmaller, and ſometimes beſet with minute criſp leaves, and the whole plant with age turns brown; neither of which

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ever happen to the rein-deer lichen; its colour always being white. What we call moſs on trees, is alſo a lichen. This elegant tribe of plants well repays the trouble of inveſtigation; and, with the moſſes, ferns, and funguſes, furniſhes the botaniſt with a complete winter garden.

Harr. The ferns and moſſes are very agreeable; but when I have gathered funguſes, they have dirtied my fingers, and I have thrown them away.

Hortenſ. Now you are a botaniſt, theſe extraordinary plants will become intereſting to you, particularly as by Mr. Curtis's, Mr. Bolton's, and Monſieur Buillard's plates, you may ſoon learn to diſtinguiſh the génera from each other. There are ſome of the fungus tribe, that are diſguſting to the ſmell, and diſagreeable to the touch; but the generality of them are not ſo, and may be diſſected by perſons of the greateſt nicety without giving offence. Within the laſt twenty years our knowledge has been greatly improved in regard to the fructification of the fungi, as well as in that of the other three orders of the claſs cryptogamia, but yet remains ſo imperfect, that their géneric characters continue

to be taken from their outer form. Hedwig's reſearches tend to eſtabliſh for a fact, that the fungi poſſeſs all thoſe parts of fructification, which in botanic language conſtitute a flower, viz. ſtamens and piſtils. The ſtamens he conceives to be a collection of pellucid ſucculent veſſels, with which innumerable oval globules are connected, of a dilute brown colour. Theſe ſmall bodies he diſcovered under what is called the curtain, a part which is found in ſome funguſes, and not in others. This is a thin membrane extending from the ſtem to the edge of the hat; which is torn as that expands, and ſoon diſappears; but the part attached to the ſtem often remains, and forms a ring round it. The parts ſuppoſed by Hedwig to be the piſtils, he found in examining a portion taken from one of the gills, which he divided with ſome difficulty into two plates, the lower edge thickly ſet with tender cylindrical ſubſtances; ſome with globules at their extremities, and ſome without: the gill itſelf appeared netted with larger and more diſtinct ſpots, a little raiſed. In another fungus, a ſpecies of agaric, after the curtain was torn, and the hat pretty fully expanded, with the gills turned yellow, he found the upper part

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of the ſtem beginning to be tinged by a brown powder, ſhed from the gills. On examination he did not ſcruple to pronounce this brown powder to be the ſeeds, and that it proceeded from the larger ſpots, that he had before obſerved in the gills; the two folds of which now readily ſeparated. He aſſerts, that he has uniformly found in the génera of Agáricus and Bolétus the globules, which he believes to be ſtamens, either on their upper or inner ſurface. In thoſe agarics, which have neither curtain nor ring, theſe globules with their threads are placed upon the ſtem.—Having given you a ſketch of the modern diſcoveries, we will now examine the outward habits and ſtructure of the fungus tribe, and from theſe circumſtances endeavour to gain ſome knowledge of the different génera.

Charles. That I ſhall much like to do; for ſeeing them daily makes me very deſirous to have ſomething more than confuſed ideas about them. But I am afraid, though Hedwig's diſcoveries ſhould be confirmed by further inveſtigation, that they will not be of much uſe to common botaniſts in the arrangement of theſe difficult plants.

Hortenſ.

Hortenſ. Certainly what can only be ſeen with very powerful magnifiers, can never ſerve for the diſtinction of the génera; in which the character being obvious and clear conſtitutes the excellence of it. It is however very deſirable, that ſuch reſearches ſhould be made. It is a decided fact, that funguſes continue their ſpecies by a powder, which is viſible in the gills of many of them, and which is generally allowed to be ſeed. Some ſpecies of the agaricus have ſo ſhort an exiſtence, that from the time of their appearance to the time, when they begin to decay, is not more than five days. The manner, in which many of them decay, is by their gills diſſolving into a very black liquor, like ink, which dropping carries with it the ſeed; which may be ſeen in the liquor, if greatly magnified. We will inveſtigate the ſtructure of one of this genus, as it is the moſt numerous of the fungus tribe, and, if well underſtood, will bring you acquainted with the bolétus, and other génera of this order. The agarics are compoſed of a pileus, or hat with gills underneath, and with, or without ſtipes or ſtems; the poſition of the ſtipes being either central or lateral; from whence ariſe

the three firſt diviſions of the genus; they have alſo a root, more or leſs obvious; and ſome of them, while in their unfolded ſtate, are wholly incloſed in a membranaceous, or leathery caſe, called the volve. This caſe muſt not be confounded with that part ſo termed by Linneus. Mr. Bolton has ſhewed us the juſt diſtinction betwixt the volve, and the veil or curtain, the latter being what Linneus has marked as the calyx, under the term volve; which has occaſioned a confuſion in theſe two parts, though in reality none can be more evidently diſtinct, or applicable to different purpoſes: the volve, wrapping round and protecting the whole plant in its infant ſtate; the veil, apparently belonging to the ſuppoſed parts of fructification only, and under which Hedwig aſſerts he has found them. From the remains of the veil a ring is formed: this part is not only uncertain in its time of duration, but even will appear in ſome years on the ſtipe, and not ſo in others; conſequently it cannot be uſed as a permanent character. The ſtem of an agáricus is either ſolid or hollow; the ſolid ſtem differs much in its degree of ſolidity, ſometimes being as ſolid as the fleſh of an apple, and

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ſometimes perfectly ſpongy. Next to the gills, the ſtem of an agaric is the part leaſt liable to vary. The gills are the part commonly known by that name, and with which every one is acquainted; they aſſume different colours in different ſpecies, and vary much in their reſpective lengths; each gill conſiſts of two membranes, and between theſe the ſeeds are formed; the gills are always attached to the hat, and ſometimes to that only; ſometimes they are not only fixed to the ſtem, but extended along it downwards, like the wires of an umbrella. This has been called a *decurrent gill.* Mr. Curtis diſcovered a peculiarity of ſtructure in the gills of the agáricus ovatus, which he had not before obſerved in any other fungus: the gills are connected together by numerous tranſverſe bars, or filaments, the uſe of which ſeems to be to keep them at an equal diſtance from each other, and thus to admit the air to the fructifications, which are ſituated on the flat ſurface of the folds, and to prevent their being deſtroyed by preſſure from their too great cloſeneſs. Theſe bars make it extremely difficult to ſeparate one of theſe folds entire: they are viſible only when greatly magnified.

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The ſecondary ſubdiviſions of the agarics are founded upon the ſolidity or hollowneſs of their ſtipes with the poſition of their gills, which, being the part wherein the fructifications are contained, is of the greateſt importance. They vary much in almoſt every circumſtance belonging to them, except in colour, which in all other plants is the moſt variable of all their characters; the colour of the gills on this account is the mark, which has lately been adopted for the diſtinction of the ſpecies; their colour is ſuppoſed to be principally, if not wholly cauſed by that of the fructification or ſeeds, and is ſaid to have been found ſufficient, with their ſtructure, to afford permanent ſpecific diſtinctions. Theſe colours change, when the plant begins to decay; and of thoſe agarics, which diſſolve away in an ink-like liquor, the gills in their young ſtate are white, ſo that to judge of their colour, the plant muſt be gathered in its firſt ſtate of expanſion, when they will be found to be grey. It is the colour of the flat ſide of the gills which muſt be attended to in the ſyſtem I am explaining to you, becauſe the colour at the edge in ſome plants is different through all the ſtages of growth; and

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in others, it changes ſooner than that of the ſides, evidently from the diſcharge of the ſeeds, when ripe. The hat of the agarics is leaſt to be depended on; its ſhape is either conical, convex, flat, or hollowed; the top like a funnel. It is conſtantly varying in the ſame plant before expanſion, but not very changeable in the ſame ſpecies, when it is nearly, or fully expanded. The colour of the hat is extremely uncertain, therefore can only be attended to as a mark of varieties. The viſcous juice on the hat and ſtipe, which is ſeen in many agarics, differs, according to their ſituation, or to the ſtate of the atmoſphere, ſo much, that the ſame ſpecies will ſometimes be found glutinous, and at other times perfectly dry. Some of the agarics contain a milky juice, more or leſs acrid: this circumſtance is not conſtant, it having been found in the agáricus rubeſcens, and the agáricus cæſareus, that plants equally vigorous, and in the ſame ſituation, will ſome of them pour out milk in abundance on being wounded, while others will not exhibit any marks of it. From the ſketch I have given you of the characters, which may be obſerved in the ſtructure of the agarics, and which is

nearly the ſame in the other genera of the fungus tribe, you may, I hope, with the aſſiſtance of plates form clear ideas of thoſe parts, from which the various kinds are diſtinguiſhed. Upon the principles I have explained to you, Dr. Withering has given the world an arrangement of the funguſes, from which you will generally be able to inveſtigate your plant. There is an exception to the uniformity in the colour of the gills in the agáricus aurantius, which ſpecies exiſts under almoſt every kind of colour, that can be imagined.

Henry. Then it is the agáricus aurantius, that we call the ſcarlet muſhroom, and that is ſo beautiful in autumn.

Hortenſ. I rather ſuppoſe, that the fungus, which you have obſerved, is the agáricus integer, or entire agáricus, as there is a variety of that ſpecies, which has its hat of blood-red colour, and which appears from Auguſt to October. The colour of many of the funguſes is beautiful; the moſt ſplendid of all the agarics is the cæſareus, which with us is a rare plant, but is common in Italy, and brought to the markets for ſale.

Juliette.

Juliette. Pray, mamma, what is the botanical name of the muſhroom that we eat, and why do we eat only of one kind?

Hortenſ. The plant, we eat under the name of muſhroom, is agáricus campeſtris, which the gardeners propagate, either by ſowing the gills, or by planting ſmall fibrous ſhoots, which are found about the baſe of the ſtipe; and which produce tubercles, in the manner of potatoes. In regard to the reaſon why this is the only fungus commonly uſed in cookery, I cannot perhaps give you one that is ſatisfactory. The caprice of mankind, in their choice and rejection of particular kinds of food, is not eaſy to be accounted for. The agáricus campeſtris however ſeems to juſtify the diſtinction, that has been given it in this particular, from its fine flavour and tenderneſs of texture: but, though we uſe it almoſt excluſively for food, it has not the ſame pre-eminence in other countries; and the inhabitants of Ruſſia devour almoſt every ſpecies, even thoſe which by other nations are eſteemed moſt poiſonous.

Harr. We hear ſtories in our country of people being poiſoned by eating even the common muſhroom.

Hortenſ. This ſeldom occurs; and when it has done ſo, it has remained doubtful, whether the poiſon proceeded from the muſhroom, or from the veſſel in which it was dreſſed; but as muſhrooms make a part of our diet, which is more palatable than nutritive, it can never be neceſſary to eat them; therefore when you find them hard, I would recommend to you not to do ſo, as it is probable the poiſonous effects which are recorded of them, may have ariſen from want of ſufficient ſtewing; as you know we have before ſpoken upon the ſalutary uſe of fire to many of our vegetables, which in their freſh ſtate would be ſo far from affording wholeſome food, that they could not be eaten without producing pernicious conſequences.

Harr. I think I have read an account of ſome part of the ſcotch fir being eaten; but I have not a clear recollection about it.

Hortenſ. From the highly civilized ſtate in which we now live, we can form but faint ideas of the neceſſitous ſituation, under which many of the inhabitants of the globe exiſt, and in compariſon of whom our pooreſt cottagers may be conſidered in a ſtate of eaſe. It is in the rigorous and unfertile climates of Sweden,

Sweden, Lapland, and Kamſchatka, that neceſſity obliges the inhabitants to make uſe of the inner bark of the pinus ſylveſtris (ſcotch fir) for food. In the ſpring ſeaſon they chooſe the faireſt and talleſt trees, and, ſtripping off the outer bark, they collect the ſoft white ſucculent interior bark, and dry it in the ſhade. When they have occaſion to uſe it, they firſt roaſt it at the fire, then grind it, and after ſteeping the flour in warm water, to take off the reſinous taſte, they make it into thin cakes, which are baked for uſe. The poor inhabitants are ſometimes conſtrained to live upon this food for a whole year, and are ſaid to be fond of it; and it ſhould be nutritive, as Linneus aſſerts, that it fattens ſwine.

Charles. Here we ſee the great advantage to be derived from the knowledge of fire: the poor people of Kamſchatka muſt be ſtarved, if they were ignorant of its properties. The ſcotch fir, I think, Ma'am, has many uſes, beſides this. I remember once expreſſing my diſlike of it ſtrongly, and wiſhing there was no ſuch tree, when you enumerated ſo many of its virtues, that I have felt reſpect towards it ever ſince.

Hortenſ. It is always a mark of ignorance to condemn any thing indiſcriminately; and of arrogance, to deſire to deprive it of exiſtence; and this kind of arrogance is too often found amongſt the inconſiderate part of mankind. When we do not find a particular vegetable uſeful to the human ſpecies, we are apt to regard it in too inſignificant a light; ſo by many are eſteemed moſt of the funguſes, whereas they afford ſuſtenance to a numerous tribe of the animal creation, a variety of inſects. The pinus ſylveſtris has been applied by mankind to more uſes than moſt other trees. The talleſt and ſtraighteſt are taken for the maſts of ſhips; the timber is reſinous, durable, and applicable to many domeſtic purpoſes; ſuch as making floors, wainſcots, boxes, and all thoſe things, which are made of deal; which is the name given to the wood of this fir-tree, when ſawn into planks. From the trunk and branches of this, as well as of moſt others of the pinus tribe, tar and pitch are obtained. Barras, Burgundy pitch, and turpentine, are acquired by inciſion. In the highlands of Scotland, the reſinous roots are dug out of the ground, and divided into ſmall ſplinters, which are burnt by

by the inhabitants to ſupply the place of candles. The moſt important uſe, we have obſerved, is made of the inner bark by the Swedes, Laplanders, and Kamſchatkans; of the ſame material, the fiſhermen at Lock-broom in Roſs-ſhire make their ropes. This ſpecies of fir has acquired the name of ſcotch, from being the only one which grows naturally in Scotland. It is found ſcattered in many places amongſt the highland mountains; and large natural foreſts of it are ſeen of many miles extent in various low-land diſtricts. From the cones of this fir a reſinous oil is extracted, which is ſaid to poſſeſs virtues ſimilar to thoſe of the balſam of Peru. This tree lives to a great age; Linneus affirms four hundred years. The anther-duſt in ſpring has been carried away by the winds in ſuch quantities, as to have alarmed the ignorant with the idea of a ſhower of brimſtone.

Henry. That reminds me of the cloud of duſt, which flies from the puff-ball, when I preſs it. What fungus is that, mamma? and is the duſt that comes out the ſeed?

Hortenſ. This powder is believed to be the ſeeds; when viewed through a microſcope,

the ſeparate particles appear of a ſpherical form, and annexed to elaſtic hairs. The puff-ball is the lycopérdon boviſta of Lightfoot and ſome other authors; but we have not yet a diſtinct knowledge of the ſpecies of theſe extraordinary plants. The truffles and morels, which we eat in ragouts, are different ſpecies of the fungus tribe. The truffle, tuber cibarium, is eſteemed by ſome people one of the beſt of the eſculent funguſes; but its tough, leather-like texture renders it, I think, very inferior to the common muſhroom; its outer ſtructure is worthy of obſervation, having the appearance of a net, from the tubular honey-comb form of the whole head of the plant. The truffles gathered in Britain are apt to be gritty, as they grow under the ſurface of the earth, at the depth of four or five inches. Dogs are taught to hunt them; and when they perceive their ſcent, they bark a little. and begin to ſcratch up the earth. Pigs in Italy are taught to root them out of the ground, accompanied by a perſon, who takes up the prey.

Juliette. That is hard upon the poor pig to diſappoint him of the fruit of his labour.

Hortenſ.

Hortenſ. We will hope the pig is allowed his ſhare, or that he is bartered with, and fed well with ſome other diet, after having procured the truffles for his maſter.—The laſt genus of the Cryptogamia claſs, that we have to conſider, is mucor or mould.---Should you ſuppoſe that the mould, you find on bread, fruits, leaves, and various other ſubſtances in a decaying ſtate, was a plant ſubject to all the laws of the vegetable kingdom?

Charles. Indeed I ſhould not have ſuſpected it; but I recollect, Ma'am, that you have told me it was a plant.

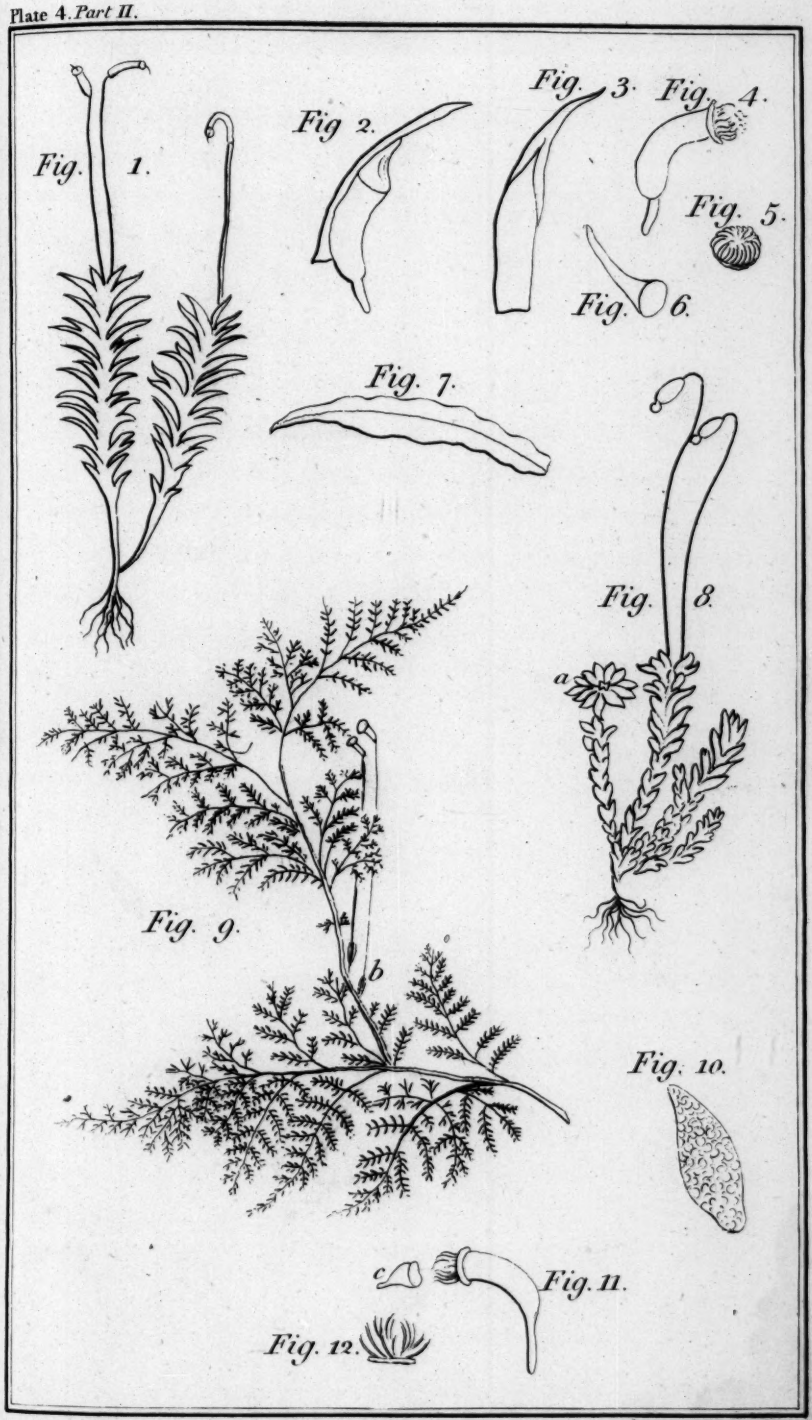
Hortenſ. By the aſſiſtance of a microſcope of common magnifying powers, you may ſatisfy yourſelf, that it is ſo; you may ſee it growing in cluſters; the ſtems a quarter of an inch high, pellucid, hollow, and cylindrical; each ſupporting a ſingle globular head, which at firſt is tranſparent, afterwards dark grey; theſe heads burſt with elaſtic force, and eject ſmall round ſeeds, which are eaſily diſcoverable by the microſcope. It is the mucor mucedo, which I have deſcribed to you; but there are thirteen diſtinct ſpecies of mould, or mucor, which appear at different times of the year; one kind, called the golden, from its

its brilliant yellow colour, covers the whole ſurface of plants, on which it grows, and ſtains the fingers yellow, if touched. It is generally found upon the plants belonging to the bolétus family, and has the property of repelling moiſture. It is ſaid to remain free from wet, though immerſed in water for a year. You are not yet ſufficiently advanced in your botanical ſtudies, to enter deeply into enquiries concerning theſe wonders of nature; but you know enough of them to intereſt you in their hiſtory.

Harr. I feel myſelf much intereſted in it, and hope, that when we become proficients in the other claſſes, you will ſtudy the cryptogamia claſs with us.

Hortenſ. With pleaſure; and in the mean time I will endeavour to underſtand it better myſelf, that I may be able to inſtruct you in it.—At our next meeting we will begin with the Graſſes, which make an important part of botanical knowledge, and which to you, Charles, will be particularly uſeful, when you enter upon Farming purſuits.

Charles. They are the plants, which I am the moſt deſirous of underſtanding, as I always



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ways think of being a farmer with great pleaſure.

Hortenſ. It is a purſuit, which a gentleman may enter into with much amuſement to himſelf; and, though he ſhould not find it immediately profitable, the reſult of his experiments may in future become ſo to mankind; which is a higher conſideration; and there is the certain and immediate good attending it, that it affords employment to himſelf, and to the induſtrious poor of his neighbourhood.—I have buſineſs this morning, which prevents me walking with you; but if you meet with any vegetable curioſities, you will not fail to bring them home with you.

DIALOGUE THE FIFTH.

On the Graſſes.

Hortenſ. On your return yeſterday from your walk, you ſo well convinced me, that you had attended to our laſt lecture, that I with pleaſure enter upon a new tribe of plants with you to-day—the Graſſes.

Charles. I think, ma'am, we all pretty well underſtand the ſtructure of the plants belonging to the four orders of cryptogamia; and we did attempt to make out ſome of the génera, but found ourſelves not equal to that, except by comparing them with different plates.

Hortenſ. I do not wiſh you to attempt any thing beyond a knowledge of their outer habits at preſent. Every year makes the inveſtigation of the génera more eaſy, as we now ſee them given in plates among other plants, with accurate deſcriptions of them; and theſe plates publiſhed at a moderate rate, ſo that moſt people can afford to purchaſe them. I ſee Henry wiſhes to aſk ſome queſtion.

Henry. I ſcraped this cruſt off the bark of a tree this morning: laſt week I paſſed it, and thought it was a part of the bark, but now

now I think it is a plant: pray what is it, mamma?

Hortenſ. It is one of the lichens, the lichen candelarius of Linneus, but from its yellow colour called the golden lichen by engliſh authors; you may ſee it well figured in Sowerby's numbers of britiſh plants, to which agreeable publication we muſt often have recourſe. We will now, if you pleaſe, begin with the graſſes; an order of plants with which you muſt become familiarly acquainted.

Harr. I wiſh much to underſtand them, but have ſo often heard them ſpoken of as being difficult, that I feel afraid of beginning with them.

Hortenſ. The graſs tribe certainly requires a particular mode of inveſtigation; and the plants contained in it are not ſo eaſy to underſtand as flowers, which have larger, and thence more obvious parts of fructification; but the method of accurately diſſecting them once adopted, you will find a knowledge of them more eaſily attained, than you imagine. Recollect the confuſion that appeared to you in the compound flowers, before you underſtood the ſeparate parts, and the regularity of arrangement, when you became

came acquainted with them, and you will be encouraged in your preſent undertaking.

Harr. You always encourage me, mamma, and make ſo much allowance for dulneſs, that I learn what you wiſh to teach me much more eaſily, than I expect to do. But whenever I am to begin with any thing new, I feel afraid, and if left to myſelf, perhaps ſhould give it up.

Hortenſ. Such feelings are common, particularly in young people, and in thoſe who have not very active minds; and are thence incapable of weighing the pleaſures of indolence againſt the vacancy, in which the neglect of improvement leaves the mind. We can do nothing without energy; perhaps I find ſometimes as much need of exertion to meet you on the ſame ſubject every morning, and to arrange the matter, that I have to teach, as you may do to attend me, that you may learn. Be this as it may, I am perſuaded, that the pleaſure on both ſides predominates; ſo we will ſhake off all indolence, and enter at once upon our morning's buſineſs. The term graſs, as it is vulgarly uſed, conveys but a vague idea; and the common obſerver is ſurrounded, when walking in a hay-

hay-field, by a variety of ſpecies, when he is not conſcious of the preciſe exiſtence of one individual.

Charles. I am ſure this has often been my caſe; every plant in a field, of which I did not ſee the flower, I remember to have called graſs.

Hortenſ. It is only of late, that this uſeful and curious tribe of plants has been attended to; ſo that the knowledge of the moſt common and valuable vegetables of the creation is yet in its infancy. They have been confounded under one common name in general, and the few, which have been diſtinguiſhed by a particular appellation, are far from being univerſally known by it. Mr. Curtis in this part of the vegetable kingdom, as in every other, has applied his reſearches to the moſt uſeful purpoſes. He has attracted the notice of the rich by his more ſplendid delineations of a variety of graſſes in his London Flora; while he has diffuſed through all ranks a knowledge of thoſe génera, which are every to be met with, by the low priced publication of his Practical Obſervations on Britiſh Graſſes; a work from which a general knowledge of the outer habits of our moſt common

mon meadow graſſes may eaſily be attained. We will now endeavour to gain a diſtinct one of ſome of the genera. This tribe forms one of the natural orders of Linneus, and poſſeſſes a variety of common characters, by which ſeveral ſorts of corn are arranged with thoſe genera, which are more commonly known by the name of graſſes. You will find a ſtriking agreement in the parts of fructification of all the graſſes that you may examine; but this is not more remarkable than the ſimilarity of their general air, their manner of growth, and their whole appearance. A ſimplicity of ſtructure characterizes the whole claſs; they have uniformly a ſimple, ſtraight, unbranched, hollow ſtem, ſtrengthened with knots at certain intervals; this, which is commonly called the ſtraw in corn, is termed by Linneus the Culm. At each knot there is always a ſingle leaf, which ſerves as a ſheath to the ſtem to ſome diſtance; when it ſpreads out into a long narrow ſurface, of equal breadth all the way, till it approaches the end, where it draws off gradually to a point. The leaf is invariably entire in every ſpecies, has neither veins nor branching veſſels, being only marked longitudinally with lines parallel to the

the ſides, and to a nerve or ridge, that runs the whole length of it. Another curious circumſtance, almoſt peculiar to this tribe of plants, and common to them all, is the ſeed not ſplitting when it germinates, but continuing entire, till the young plant is ſufficiently nouriſhed by its mealy ſubſtance to ſeek its own food; at which time there remains of the parent ſeed only the dry huſk. Theſe plants are termed by Linneus one-cotylédoned, or one-lobed.

Henry. I remember this in wheat. One day I plucked up a root in a corn-field, and found the ſeed ſticking amongſt the fibres.

Hortenſ. If you had preſſed the ſeed, you would have found, that the ſkin only remained; the nouriſhing part having been abſorbed by the young plant, but this part of the ſubject we muſt refer to future enquiry; it is ſufficient to know, that every plant that comes under the denomination of a graſs, has its ſeed of only one lobe, or cotylédon. Before we proceed further, we will examine, whether the characters of the tribe, I have been explaining to you, are juſt. I gathered this morning a few graſſes for the

purpoſe. The common meadow fox-tail, alopecurus pratenſis, will ſhew the peculiarities, that we are to look for, as well as any other; and it is better to make yourſelf acquainted with them in the real plant than by plates, though Mr. Curtis's London Flora will afford you much amuſement and information on the ſubject.

Harr. I find all the characters, that I am to look for in the leaf and ſtem of this fox-tail; and I recollect having ſeen the ſame knots, ſheaths, and leaves, in oats, barley, and wheat. We have often amuſed ourſelves by ſlipping the ſtraw out of its caſe in corn; but the ſtems of graſs are ſo ſlender, that they bend, and are ſpoiled, before the ſheath can be taken off.

Jul. And ſome are ſo rough, that they prick the fingers.

Hortenſ. Upon examining the leaves and ſheaths by a microſcope, you will find many of them furniſhed with briſtles, which give them the appearance of a ſaw; from this circumſtance, or the contrary, the ſpecies are frequently diſtinguiſhed one from the other. The parts of fructification are what you have now to attend to; from their want of ſplen-

dour

dour they commonly paſs unnoticed, though their beauty and ſtructure are ſuch as muſt excite our higheſt admiration, when known. The natural character of the flowers of graſſes is their having a glume, or huſk, which is the term given to their calyx by Linneus. This glume is compoſed of one, two, or three valves, generally only two; the larger valve hollow, and the ſmaller one flat. Theſe valves are a kind of ſcales, with their edges commonly tranſparent, and moſt frequently terminated by a pointed thread, termed by Linneus ariſta, or awn.

Henry. I have often obſerved that briſtle in barley.

Hortenſ. It is particularly ſtrong in the hordeum genus, of which barley is a ſpecies; but you may find it in a leſs degree in various other génera, though not conſtant through every ſpecies; from whence its preſence or abſence is uſed by Linneus as a ſpecific diſtinction. The corol of graſſes is alſo termed a glume, and in reality is only a dry ſkinny huſk, conſiſting of two valves. You may compare the calyx and corol with a magnified drawing, and look at the natural plant through a microſcope, and you will then

underſtand their conſtruction. The diviſion of the outer glume, or calyx, ought always to be attended to, as it is often made uſe of by Linneus to mark the génera.

Harr. I ſhould have been puzzled to have determined, whether the graſſes had corols or no; I ſhould have ſuppoſed all theſe huſks to have belonged to the calyx.

Hortenſ. Call them glumes, as that is the proper term. We have before ſeen, that the limits between the calyx and corol are not ſufficiently defined; therefore we are to underſtand them at preſent, according as Linneus has diſtinguiſhed them. The inner glumes of the graſſes we are to conſider as the corol, the outer as the calyx. The flowers of this tribe have alſo univerſally a viſible nectary, conſiſting ſometimes of two very ſmall oblong leaves, placed at the baſe of the germ, and ſometimes different kinds of ſcales in the ſame ſituation, which are diſtinctly ſhewn in Mr. Curtis's plates of both the hóleus mollis, creeping ſoft graſs, and mélica uniflora, ſingle flowered melic graſs, and mélica cærulea, blue melic graſs, and are not difficult to be ſeen in the natural flowers. Though very minute, you may ſee the

the leaves, of which the nectaries are compoſed, at the baſe of the germ of the flowers of wall-barley.

Charles. I ſee two very ſmall tranſparent leaves, very like the corol, but leſs; they are the nectaries, I ſuppoſe.

Hortenſ. They are ſo named by Linneus, but as they furniſh no géneric diſtinction, they are not noted in the characters of all the génera. The number of ſtamens, that you will generally find in theſe flowers, is three, with two piſtils, within the ſame cover. But there are exceptions to this rule, which I will explain to you preſently. The ſtamens have three hair-like filaments with oblong anthers of two cells. The ſtyles of the piſtils are downy, bent back, with their ſtigmas beautifully feathered, in ſome ſpecies large and branching, which, with the anthers waving on their long filaments, form a moſt elegant appearance; but their parts are ſo delicate and minute, that they are ſeen to greater advantage, if viewed through a microſcope.

Harr. The anthers of this fox-tail, alopecúrus I muſt now call it, are very pretty; but I do not ſee the piſtils.

Hortenſ. The cloſe ſpiked graſſes do not ſhew the parts of fructification ſo well as thoſe with looſer ſpikes, or the panicled kind. In feather graſs, ſtipa pennata, they are very well ſeen, if examined in a proper ſtate; but it is even more neceſſary to inveſtigate theſe flowers, before their anthers have diſcharged their duſt, than thoſe of the other claſſes; for as ſoon as the caſes containing it are burſt, the whole plant aſſumes a withered aſpect, and all parts, except the ſeed, fall to decay. Theſe flowers have no ſeed-veſſel, and only a ſingle ſeed; which is encloſed by either the calyx or corol, from which, when ripe, it is emitted in various ways. The twiſting of the long awn of feather-graſs, in order to extricate itſelf from its receptacle, which in this tribe is the ſtem lengthened out to ſerve that purpoſe, gives it a very peculiar appearance. This will alſo happen if you gather a bunch of the ſeeds, and bind them tight together; they will twine themſelves into all kind of directions, till they get looſe from the bondage, that you have impoſed upon them, and thus commit themſelves to the earth, where they vegetate and produce a new progeny.

Jul.

Jul. I remember laſt ſummer gathering ſome feather-graſs to dreſs my doll with, and had tied it together with a ribbon; but after it had been in her hat half an hour, it all ſtood different ways, and I pulled it out.

Hortenſ. Had you ſuffered it to twiſt, as much as it pleaſed, and then cut off the ſeeds, you would have found it more manageable. I recommend briza to you, as ſtill more ornamental than the feather-graſs. The beautiful drooping ſpikes of the *briza maxima* are peculiarly elegant from their tremulous motion, cauſed by their ſlender peduncles, and from whence the genus derives its common name of quake graſs. In the flowers of this ſpecies you may alſo ſee the parts of fructification to advantage.

Henry. I think I have ſeen it. Yeſterday I ſeparated the joints of one of the ſpikes, and ſaw ſtamens, and two pretty little feathers, like what you juſt now told us were the ſtigmas. I intended to aſk you about them, mamma, but I forgot.

Hortenſ. I ſhall always be ready to reſolve any difficulties that may occur to you in botany, or on any other ſubject that I am able; and though I may not be acquainted with it

myſelf ſufficiently to inform you, as much as I wiſh, I may probably find ſome method of attaining the knowledge, we are ſeeking after, in a more effectual manner, than you can yourſelf. I am never aſhamed of confeſſing my ignorance, where I have not neglected opportunities of improving myſelf, by which means I generally acquire ſome information, whenever I enter ſociety qualified to give it. But to return to our graſſes. Though the characters I have given you of the parts of fructification are all found nearly conſtant in thoſe génera, which are placed in the claſs triandra, or three-ſtamens. There are others which fail in the claſſic character of the number of ſtamens, and are thence placed by Linneus in different claſſes; which ſeparation of plants, manifeſtly of the ſame natural order, is the more extraordinary, as in ſome caſes he has not thought it neceſſary ſtrictly to adhere to the obſervance of the claſſic character, when it has ſo directly militated againſt an obvious ſimilarity in every other part of the fructification, as in holcus lanatus, but has made the difference the foundation of a ſpecific character. The holcus lanatus, meadow ſoft graſs, having ſome of its flowers

flowers deficient in the proper number of ſtamens and piſtils, which would rank it in the claſs and order triandria digynia. Linneus has torn it from all its natural connections, and placed it amongſt a tribe of plants, in the claſs polygamia, to which it has no affinity.

Harr. I dare ſay, mamma, that you can make ſome good excuſe for Linneus.

Hortenſ. His moſt flagrant faults, of which this muſt be eſteemed one, admit of this excuſe, namely, the greatneſs of the work, with which he has enlightened the botanical world. We ought to be leſs ſurprized, that we find in it a few imperfections, than that there are not more. This regarding the hólcus, I am inclined to think, eſcaped by ſome accident his correction, as it is not uncommon to find the ſame imperfection in the flowers tríticum and hórdeum, wheat and barley, and ſome other graſſes, which cannot be conſidered as conſtant, but may ariſe from a variety of cauſes: though I am in doubt, as the character of the claſſes is purely arbitrary, whether in all caſes it would not have been better to have obſerved it uniformly, than ever to have deviated from it. So,

for

for inſtance, the genus anthoxánthum, which in every particular agrees with the character of the graſs tribe, except that of its number of ſtamens, which are only two, and that without variation. From this circumſtance Linneus has placed it in the claſs diándria, two-ſtamens. Had he done otherwiſe, a young botaniſt muſt have found himſelf much perplexed; the claſſic character being the firſt that he would refer to, he could never find the anthoxánthum in a claſs, the eſſential character of which was three-ſtamens, though, from its general appearance, he could not expect to find it ſeparated from the reſt of the graſſes.

Harr. I always firſt look for the number of ſtamens in the flowers of all the ſimple claſſes; ſo I ſhould certainly be miſled if the anthoxanthum was placed in the third claſs.

Hortenſ. There is no other known graſs that has only two ſtamens. Its common name of vernal graſs is given to it from its early appearance in the ſpring, it being the ſecond of the engliſh graſſes that comes into bloſſom; from which circumſtance it is valuable to farmers, and alſo from its readineſs to grow in all ſoils and ſituations.

Charles. I remember the plant vernal graſs. Mr. Johnſon of the Park Farm once ſhewed it me, and ſaid, you will be glad to ſee this graſs, when you are a farmer.

Hortenſ. Mr. Johnſon is ſo civil and intelligent, that you may gain much improvement from him: we muſt beg his aſſiſtance, when you enter upon agricultural experiments. His ſound practical knowledge may be very uſeful to you; the danger of experiment-making is too ſtrong an attachment to theory. The anthoxánthum is the graſs, which gives the fragrant ſcent to hay; and if the leaves are gathered, and folded up in paper, they will retain their agreeable ſcent for a long time: hence the ſpecific name given to it by Linneus, of odorátum. It has been ſaid to be the only engliſh graſs that has fragrance; and this may be true reſpecting the leaves. But Mr. Swayne in his account of paſture graſſes informs us, that the flowers of the annual pea have a ſweet ſmell like thoſe of the reſéda adorata, mignonette; and that the ſcent remains in the flowers, when dried. The anthoxánthum is ſaid to have two modes, by which it is propagated; firſt, the common way,

way by ſeeds; and ſecondly by bulbs formed upon its ſtems, which fall off when mature, and ſtrike root into the ground. This circumſtance is ſaid alſo to take place in many of the alpine graſſes, by which means their ſpecies are preſerved, which would otherwiſe be annihilated, ſo perpetually are their ſeeds devoured by ſmall birds.

Jul. Pray, mamma, from what graſs does the ſeed, that I give my canary-bird, come?

Hortenſ. The name of the genus is phálaris, the ſpecies with which you feed your bird is called canarienſis, for the ſame reaſon that the bird is ſo named, being a native of the Canary iſlands. The ribbon graſs, with which you are ſometimes ſo fond of adorning yourſelf, is a variety of another ſpecies of phálaris, the arundinacea, or reed-phálaris, and makes a beautiful appearance amongſt the gayer colours of a flower-garden. The genus avéna, to which the common oat belongs, is obviouſly marked by a twiſted and jointed awn, which iſſues from the back of the corol. The ſeeds of avéna fatua, fool's oat, or as it is commonly called, wild oat, exhibit an amuſing ſpectacle. If placed on a table, after having been moiſtened in water, they

they twiſt themſelves about with ſo much appearance of life, that the plant has been called the animated oat. There is alſo a curious circumſtance belonging to the ſeed of barley; its awn being furniſhed with ſtiff briſtles, which will all turn towards the point, like the teeth of a ſaw. As this long awn lies upon the ground, it extends itſelf in the moiſt air of the night, and puſhes forward the barley-corn, to which it adheres: in the day it ſhortens, as it dries; and as theſe points prevent it from receding, it draws up its pointed end, and thus, creeping like a worm, will travel many feet from the parent plant.

Jul. This is extraordinary indeed, the barley-corn walks! Did you ever ſee this, mamma?

Hortenſ. I cannot ſay that I have ſeen it, but the fact is related by ſuch reſpectable authority, that I cannot doubt of it. I am acquainted with a gentleman, who made a wooden automaton upon the principles of a barley-corn, which ſucceeded ſo well, that it walked acroſs the room, in which it was kept, in the ſpace of a month or two.

Charles. I recollect Mr. Wilſon ſhewing me

me an account of both the automaton and the barley-corn, in the Botanic Garden, and made me underſtand the principle, upon which they moved.

Hortenſ. Such experiments are very amuſing, but are of little value till applied to ſome uſeful purpoſe. Such ought to be the object of all our exertions, and the teſt of their merit the degree by which mankind may receive benefit from them. You eat your daily bread without reflecting on the experiment-maker, who firſt introduced corn as an article of food.

Harr. Indeed I never thought of its firſt introduction, or of being grateful to the perſon, who beſtowed ſo great a benefit on the world. Pray tell me, mamma, to whom I muſt feel obliged?

Hortenſ. What think you of Ceres, who was deified by the people of Egypt on this account; and as from that nation we have received our uſeful arts, it is to her that we muſt pay our tribute of gratitude; not however as to a goddeſs, but as to a human creature, whoſe uſeful diſcoveries deſervedly placed her in a high rank as a mortal, and in thoſe dark ages cauſed her to be revered as divine.

The

The deities of the heathen nations will frequently be found to originate from men, who by the ſuperiority of genius over their cotemporaries benefited mankind by uſeful and important diſcoveries. Such was Oſyris, who invented the plough. The ſtraw of the oat is alſo believed to have been the firſt muſical inſtrument, invented in the paſtoral ages of the world, before the diſcovery of metals.

Harr. It is very agreeable to trace to their origin things, that are now ſo familiar to us, that we are apt to enjoy them without reflection. I will never forget Ceres.

Hortenſ. Remember however, that ſhe has a claim to only a ſecondary gratitude. We cannot contemplate the fruits of the earth, which are ſo bountifully beſtowed on all climates, and the faculties with which man is endued to diſcover their uſes, but we muſt adore in ſilent and grateful praiſe, the beneficent Creator of all things. Wheat, tríticum hybernum, the moſt nutritive of the various grains, which are applied to the uſe of food, is found in moſt parts of Europe and Aſia; where the climate is too hot for its cultivation, as in the torrid zone, its place is well ſupplied by what you call indian and

turkey

turkey wheat, which is a ſpecies of zea; a genus placed by Linneus in the claſs monoecia, one-houſe. At dinner you may obſerve the long threads, which are ſo great an ornament to the pickled wheat, amongſt the weſt indian pickles. Theſe are the piſtils of the ſeparate florets of the zea: in a riper ſtate you have ſeen the ſame corn at Mrs. Armitage's, who feeds her parrot with it.

Jul. I have often ſeen it at Mrs. Armitage's: when the ſpike is entire, it looks ſomething like a pine-apple. Mamma, you have not mentioned rice, is that a graſs?

Hortenſ. It is arranged amongſt the graſſes in the natural orders of Linneus; but wanting the eſſential claſſic character of his artificial ſyſtem, it is there ſeparated from them, and placed in the claſs monoecia, one-houſe; it belongs to the genus ory'za. In moſt eaſtern countries rice is the chief ſupport of the inhabitants; and ſo far, as it is uſed for food, is wholſome and nutritive: but as we too often convert what, if properly uſed, would be a bleſſing into a curſe; they are not content with that, but make from it a ſpirituous liquor, called by the engliſh arrack; which, like all other ſpirituous liquors, may be

be eſteemed a ſlow poiſon. Moſt of the plants belonging to the natural order of graſſes afford plentiful and nutritive food not only to mankind, but to beaſts, birds, and inſects, and have the remarkable property of not being deſtroyed, though continually trampled upon: indeed they are conſtantly renewed by ſeeds; as their flowers, juſt as in other plants, are never eaten by cattle, which, if left at liberty in the paſture, uniformly reject the ſtraw on which the flower grows, devouring only the herb of the plant, ſo that the ſeeds which eſcape the ſmall birds, ripen, fall to the ground, and renew their ſpecies. For thoſe graſſes, which are more liable to have their ſeeds deſtroyed, or which from the coldneſs of the climate, that they inhabit, cannot bring their ſeeds to perfection, I have juſt now told you, that nature has provided another mode of encreaſe, which like all other proviſions of nature is truly admirable. Do you think you are acquainted with the different parts, which you may expect to find in graſſes?

Harr. I think I am, and I dare ſay we ſhall all be able to aſſiſt each other in accurately diſſecting them.

Hortenſ. Take out with you a ſmall microſcope, and amuſe yourſelves with trying your ſkill in your newly acquired knowledge of this tribe of plants. I will join your party in about an hour. To-morrow, after you have diſſected a few graſſes, we will begin to ſtudy thoſe characters, by which plants are ſpecifically diſtinguiſhed in the Linnean ſyſtem.

DIALOGUE THE SIXTH.

Anthoxanthum described. Specific Distinctions, and double Flowers.

Harr. We have brought a few grasses, that we may examine their fructification through a more powerful microscope, and with your assistance. We think we have made out the parts pretty distinctly by our small one. The nectary we should not have discovered, if you had not shewed it us in a magnified drawing. We have not atempted to make out any of the genera in our first trial, except that of the anthoxánthum; its two stamens and sweet leaves made us acquainted with it immediately.

Hortens. There are some peculiarities in the fructification of anthoxánthum odoratum, which are worth attending to; we will dissect your specimen, and compare the parts with a magnified plate. It agrees with many other grasses in its small spikes, containing only one flower, but differs from the whole tribe in the following particulars: one of the valves of the glume, or calyx, is small

and membranous, the other large; and wrapping up, as it were, the whole of the fructification. Theſe glumes have been obſerved not to open and expand themſelves, as in the avéna genus, and other graſſes, but the ſtamens and piſtils have the appearance of puſhing themſelves out of the glumes, which remain cloſed; the glumes of the corol are not like thoſe of other graſſes, but are remarkably hairy, each having an awn, the longeſt of which ſprings from the baſe of the glume, and is at firſt ſtraight; but as the ſeed becomes ripe, the top of it is generally bent horizontally inward; the other awn ariſes from near the top of the oppoſite glume or valve. The nectaries alſo differ as much from their common ſtructure, in this order of plants, as the other parts of fructification; they are compoſed of two little oval ſhining valves, one of which is ſmaller than the other: theſe cloſely embrace the germ, and are difficult to be ſeen, unleſs they are obſerved at the moment of the anther's protruding from between them, at which time they are very diſtinct: as ſoon as the anthers are excluded, they again cloſe on the germ,

and

and form a coat to the ſeed, which remains with it.

Charles. Now I find why we could not diſcover the nectaries, though I wonder that they eſcaped us, as we obſerved your rule, ma'am, which has been of great uſe to us, of examining flowers in all their different ſtates of maturity.

Hortenſ. The ſimilarity of calyx, corol, and nectary, in the graſs tribe, and the minuteneſs of them all, will frequently prevent your accurately diſtinguiſhing them from each other, till you are become familiar with the appearance of all theſe parts, and then you will find them not more difficult of inveſtigation than the fructification of other plants.

Jul. We gathered this wall-barley on the road ſide, as we were walking, and looked for it in the Syſtem of Vegetables, but were puzzled by finding it deſcribed with an involucre. Pray, mamma, explain it to us?

Hortenſ. The term involucre, on the firſt view of the hordeum genus, to which the wall-barley belongs, does not ſeem properly applied; but if you ſeparate the florets from their receptacle, the ſpike-ſtalk, you will ſee

ſix longiſh, narrow, pointed leaves, at the baſe of each, which will immediately give you the idea of an involucre. What are thoſe graſſes which you have put into that hyacinth glaſs?

Harr. We do not know, ma'am, but we brought them, that we might ſee them through the microſcope.

Hortenſ. This is the hólcus mollis, (ſoft) which when magnified, ſhews the fructification very diſtinctly. Linneus has placed this graſs in the claſs polygamia, even with more impropriety than the lanatus (woolly), as the flowers of this ſpecies have all both ſtamens and ſtyles. Mr. Curtis ſeems juſtly to think, that it ought to have been placed in the áira genus, but that is not our preſent enquiry; and as you enter further into an acquaintance with the tribe, you will find all peculiarities noted, which give cauſe of any difference of opinion from Linneus, in Dr. Withering's botanical arrangements; in that publication much pains have been taken with the ſubject. By ſtudying the plate with its explanatory table, which he gives from a work of Linneus, and attending to the remarks inſerted from other authors, you will

not

not be long, before you can refer a graſs to its genus, as readily as you can a compound flower; added to which you have the great advantage of conſulting Mr. Curtis's London Flora. Your other graſſes are the lólium perenne, perennial darnel, and the dáctylis glomerata, glomerate cock's foot: you ſhall diſſect their flowers, and afterwards, as you ſeem to have clear ideas of the mode of inveſtigating their parts of fructification, we will proceed to the ſtudy of the ſpecific characters, by which every individual is diſtinguiſhed from others of the ſame genus.

Charles. I ſhould expect to find the attainment of that knowledge difficult, if we had not ſo lately ſeen the power of Linneus in the diſcrimination of the génera.

Hortenſ. In the part of botany, upon which we are now entering, we are even more obliged to Linneus for the order, that he has introduced, than in any other. He was the firſt, who began to form eſſential ſpecific characters. Before his time there were no ſpecific diſtinctions worthy of notice; from which deficiency aroſe great confuſion. Now the knowledge of the ſpecies conſiſts in ſome eſſential mark or character,

by which it alone may be diſtinguiſhed from all other ſpecies of the ſame genus. Theſe diſtinguiſhing characters are noted by Linneus after every individual of a genus, and this is called the ſpecific deſcription. To each ſpecies he has given a name appropriated to itſelf, which he has termed the Trivial Name. Sometimes this name expreſſes ſome quality of the plant, to which it belongs, but as frequently is arbitrary; and perhaps it would be better, that it was always ſo, as the names by which we diſtinguiſh the individuals of a family. You are all Montagues; but when I wiſh to make it known to which particular perſon I addreſs myſelf, or ſpeak of, I ſay, Charles or Harriet Montague, which makes me immediately underſtood: whereas, were I to ſay Montague with the dark brown, or Montague with the yellow curling hair, the perſon tō whom I ſpoke would have theſe circumſtances to recollect, and to conſider whether they really exiſted.

Harr. Yet I think I could more eaſily remember a name, that gave me ſome idea, than one which had no particular ſignification.

Hortenſ. It may require ſome trouble at firſt

firſt to acquire the uſe of arbitrary names, but the advantage of them when acquired is every day demonſtrated. Of this you cannot doubt, if you attend to the confuſion occaſioned in common converſation, by people who will not uſe the proper name of whatever they attempt to deſcribe: they introduce all kind of circumſtances to make themſelves underſtood, and at the end of their endeavours leave the perſon, whom they would inform, in deſpair of ever acquiring any knowledge from their deſcriptions. Could the diſtinguiſhing mark of each plant be expreſſed by one word, and that word be uſed as the name for the individual, or what is called the trivial name, it would greatly facilitate the knowledge of plants; but this we cannot at preſent hope, though I have no doubt, that we ſhall ſee great improvement take place in this part of the Linnean ſyſtem of botany, as well as in ſome others.

Harr. I promiſe to make uſe of the trivial names, as I acquire them, with as much aſſiduity as I have done of the géneric ones, and all the botanic terms. I aſſure you, mamma, we make quite a point of uſing them.

Hortenſ.

Hortenſ. I dare ſay you do; and you will find the advantage of it, when you hear botaniſts converſe, or ſtudy botanical deſcriptions. The excellence of the Lichfield tranſlation is, that by acquiring the language of it, we cannot be at a loſs, when we meet with accounts of plants given in latin; whereas when the terms are attempted to be made more engliſh, we cannot uſe them, except when converſing with an engliſh botaniſt. When we began with the géneric names, I pointed out this inconvenience to you; the ſame objections occur againſt forming trivial names in our language, in preference to a literal tranſlation of thoſe given by Linneus. One or two inſtances will ſhew you what I mean. Out of ſix ſpecies of plantágo deſcribed in the botanical arrangements of britiſh plants, there are only two, which have their trivial names tranſlated, ſo that a ſtudent, who formed his language from that work, would find it almoſt equally difficult to underſtand a Linnean botaniſt, when he ſpoke of plantágo media (middle), or plantágo lancéolata (lanced), one being termed hoary, and the other rib-wort, as if he was ignorant of the ſcience. Alſo rúmex pulcher, or beautiful, has

has the trivial name fiddle given to it; and pulmonária officinális, officinal, is called broad-leaved. Many more ſuch falſe names could I enumerate, which are equally aukward and injurious to the ſcience, and what every true botaniſt ought to avoid. I warn you ſtrongly from the uſe of ſuch terms, as I hear them not unfrequently defended, as being eaſy to acquire; but ſuch defenders are too idle to think much on the ſubject, and of courſe are little aware of the narrow extent to which their botanical knowledge can carry them, if founded only on the language of their own country, and of the plants contained in it.

Henry. Mrs. Pratt always make Juliette and me call every thing by its proper name, and will not underſtand us, if we do not.

Hortenſ. She is quite right. We will now conſider from what circumſtances Linneus has taken his ſpecific deſcriptions: he lays it down as a fundamental rule, that they are to be formed from ſuch parts of plants, as are not ſubject to variation; great inconvenience having ariſen from the want of obſervance of this rule among former botaniſts; every variety being ranked by them as a diſtinct

ſpecies.

ſpecies. Colour is decidedly one of the leaſt permanent characters to be found in plants, conſequently not to be admitted into the ſpecific character; however I muſt acknowledge, that in contradiction to more than one of his own rules, Linneus has made uſe of colour, and other variable properties in plants, to diſtinguiſh them individually one from another.

Harr. Though, mamma, you always defend Linneus, you never ſcruple to acknowledge his faults.

Hortenſ. Not to do ſo would be a very diſhoneſt conduct. Beſides that, we never injure our friends ſo much, as when we weakly defend them; a candid acknowledgment of both our own faults, and of theirs, is the beſt method of diſarming ſeverity, when we are obliged to bring them forward. I wiſh to prepare you for the flippant attacks, which you will meet with on this great man, both in books and ſociety: beſides that, if I omitted to point out to you the defects of his ſyſtem, I ſhould in many reſpects miſlead you. In treating of the errors into which botaniſts have fallen, among other excuſes, he mentions the ſhortneſs of human life, than

which there cannot be a better apology for his own failures. Such a ſyſtem, as he has formed, is too great to allow of being brought to perfection in the ſhort period which one man can be ſaid to live, if we ſubtract from his date infancy and old age.

Charles. We are all obliged to you, ma'am, for always having guarded us againſt violently praiſing, or cenſuring any body; and when I feel myſelf inclined to do either, I am checked by the recollection of your kind admonitions. I am very deſirous to enter further into the ſubject of ſpecific differences.

Hortenſ. Linneus eſteemed the root of plants a true ſpecific mark, but from the difficulty of obtaining a ſight of it has never made uſe of that part as ſuch, if any other, equally permanent and more obvious could be found. The trunk and ſtalks of vegetables in many inſtances afford ſuch eſſential differences, that they ſerve to aſcertain the ſpecies beyond a doubt. In the genus hypéricum, three of the ſpecies are accurately diſtinguiſhed by their ſtems being round, two-edged, and ſquare. The different kinds of infloreſcence and fulcra furniſh alſo permanent marks. Linneus has too made uſe of parts

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of the fructification for the purpoſe of diſcriminating the ſpecies, which is done with good effect in many inſtances, though certainly in a few caſes, in contradiction to the principle, on which the claſſes are founded, if conſidered with ſtrictneſs, as in ſome of the graſſes; but where the characteriſtic mark of either claſs or order are not interfered with, the parts of fructification form obvious and agreeable marks of ſpecific diſtinction, as in ſome of the hypéricums, the ſpecies are diſtinguiſhed by their number of ſtyles; and in gentiána, the form and diviſion of the corols afford an obvious and permanent difference, which cannot be miſtaken by the moſt ſuperficial obſerver.

Jul. I know three or four ſpecies of gentiána by the diviſions and forms of their corols. I wiſh all plants were as eaſy to be diſtinguiſhed.

Hortenſ. Many of them are, though others are difficult to aſcertain. Before you can hope to arrive at a ready diſcrimination of them, you muſt ſtudy leaves under all their various forms. It is from leaves that the moſt elegant and natural ſpecific diſtinctions are taken. Nature delights in variety in none

of

of her works more than in that of leaves. The different ſorts are exceedingly numerous, and ought to be attentively ſtudied by every pupil in botany. In the preſent part of the ſubject, we are to conſider them only as marks of diſtinction, by which the individuals of a genus are known from each other. Their uſe and formation belong to another part of our ſtudy.

Harr. I admire leaves ſo much, that I am ſure I ſhall have great pleaſure in ſtudying the various kinds.

Hortenſ. We muſt take them methodically, and ſhall then find them not difficult to underſtand, with the aſſiſtance of the plates, and botanical terms, and definitions given at the beginning of the ſyſtem of vegetables. We are firſt to conſider the form of leaves, by which you are to underſtand their external ſtructure. Reſpecting their form, they are divided into ſimple and compound leaves. Simple leaves are thoſe, which have only a ſingle leaf on a petiole, or foot-ſtalk. Theſe ſimple leaves may differ in reſpect to many circumſtances, but they are ſtill ſimple, if the diviſions, however deep, do not reach to the mid-rib. There are ſixty-two ways in which

which a ſimple leaf may be diverſified, all of which you muſt ſtudy with the plates, and the terms of explanation annexed to them. The genius of Linneus is more conſpicuous in this part of his ſubject, than even in any other. He has formed a language, which in the moſt conciſe expreſſive manner poſſible depictures ſuch a variety of forms of leaves, fruits, flowers, ſtems, and ſeeds, as no other was ever before made to deſcribe. The introduction of theſe excellent terms to engliſh botaniſts we owe to the Lichfield tranſlators of Linneus's works. I have requeſted Mr. Wilſon, Charles, to read with you the preface and advertiſement prefixed to the tranſlated ſyſtem of vegetables: I ſhall read them with Harriet, and you may both receive much information from them.

Charles. Thank you, ma'am. It will require a great degree of practice to get acquainted with that amazing variety of form in the ſimple leaves, in many of them too there appears to be ſo very little difference.

Hortenſ. Attention and habit will make them familiar to you. I muſt enter a little further into the Linnean language as applied to the ſpecies of plants, and then you will

will ſoon underſtand it without much difficulty. He has taken words expreſſive of well known figures, as the words oblong and egg, which ſimply uſed ſignify that the leaf or ſeed is one of thoſe forms; by compounding thoſe words a form between both is expreſſed; if it partake moſt of the oblong, that word precedes the egg, and contrariwiſe; ſo that the two words, oblong and egg, are made to repreſent forms of four kinds very nearly allied. Thus has Linneus compounded all the different forms under which leaves can appear; and by having done ſo has been able in a few words to preſent before our eyes the eſſential ſpecific characters of a variety of plants; which by other authors are deſcribed with ſo little preciſion, and ſo diffuſely, that we are bewildered by the innumerable diſtinctions, to which we have to attend.

Harr. I now underſtand the merit of this, ſince I have profited by it in the generic deſcriptions. The difficulty will be to attain a preciſe idea of theſe forms.

Hortenſ. You muſt begin by comparing the natural leaves with their forms given in

the plates. The leaves of daiſie (béllis) are oblong, thoſe of beech (fágus ſilvatica), and pepper-mint, (méntha piperita), egg-form, of violet heart-form, roſemary, roſmarinus officinalis, and crócus, linear; or every where of an equal breadth. When you have well ſtudied the ſimple forms, you muſt then endeavour to underſtand thoſe, which are compounded from them; and by drawing compound the forms yourſelves, till they become familiar to you. Pulmonária officinalis, commonly called jeruſalem cowſlip, has its radical, or root leaves, of the form betwixt egg and heart; in expreſſing which, and the reſt of the compound forms, the Lichfield tranſlators have moſt happily imitated the conciſeneſs of their author; and in their language you will find the terms, egg-hearted, heart-lanced, uſed inſtead of between-egg and heart-ſhape, heart and lance-ſhape, and ſo of them all. The term arrowed is uſed for arrow-ſhape; lyred for lyre-ſhape; twoed, or threed, for growing two together, or three together: indeed inſtances occur ſo frequently of the agreeable conciſeneſs, with which the language of the tranſlated Syſtem

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EXPLANATION OF PLATE V. PART II.

FRUCTIFICATIONS OF GRASSES.

Fig. 1. A Spike of Alopecúrus Praténſis, Meadow Fox-tail.

Fig. 2. A Floret magnified. *a*, The Glume of the Calyx, with its long Awn fixed to the baſe. *c*, The Stamens. *d*, The Stigma.

Fig. 3. A Floret of the natural ſize ſeparated from the Spike.

Fig. 4. The Stigma and Seed.

Fig. 5. The Germ and Styles of Póa triviális. *e*, *e*, The Nectary Glands.

Fig. 6. The Seed with a woolly ſubſtance at its baſe.

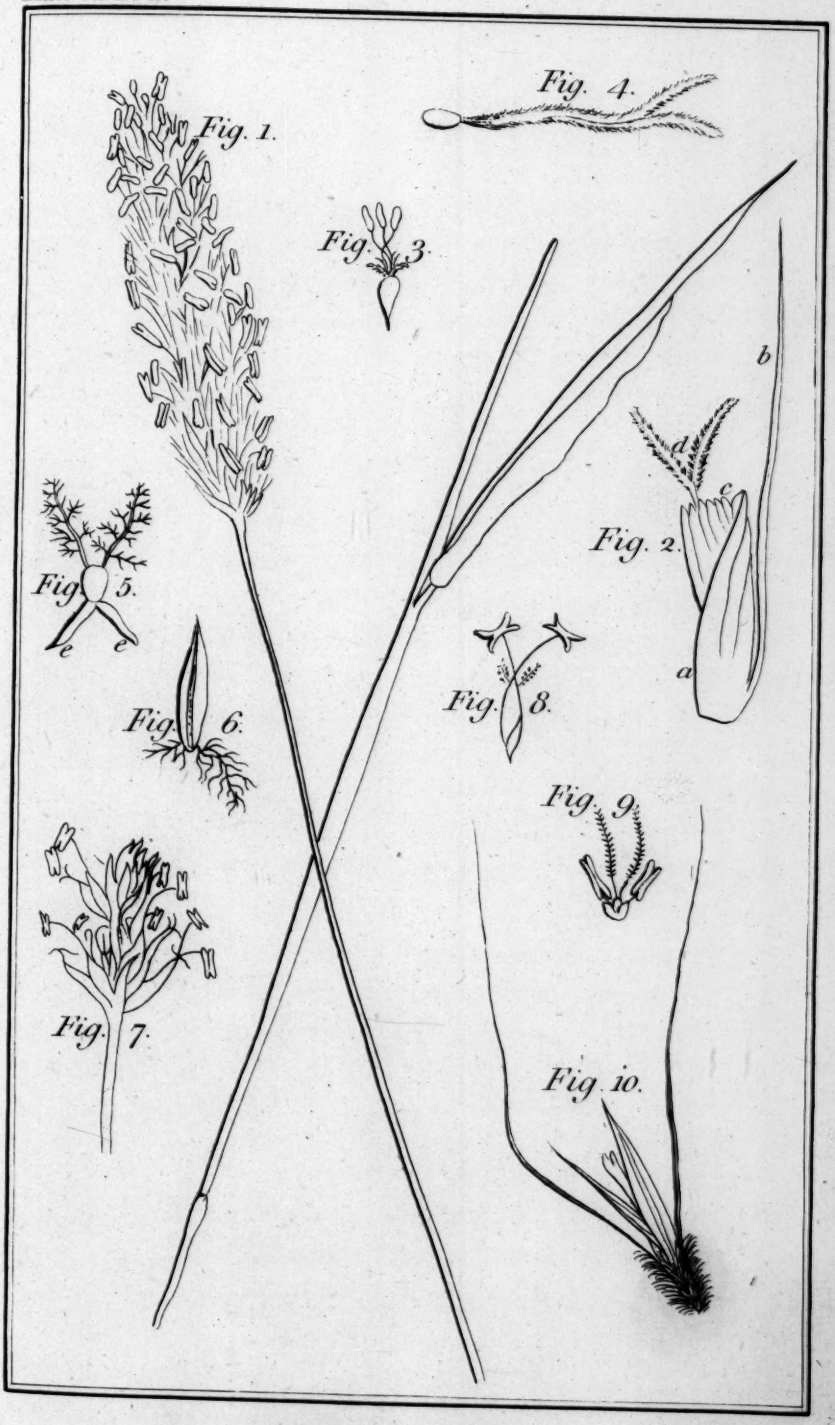
Fig. 7. Part of a Spike of Anthoxánthum.

Fig. 8. The Stamens, Styles and Seed, with the adheſive Nectary Glumes.

Fig. 9. The Nectary Glumes at the moment of protruding the Anthers.

Fig. 10. A Floret of Avéna Fatua, Animated Oat.

Plate 5. *Part II.*



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of Vegetables is formed, that it would be difficult to enumerate them all: it is a work of the higheſt value to an engliſh botaniſt.

Henry. I do not think the language odd now; but it did ſeem very ſtrange, when firſt we began to learn it in the géneric deſcriptions.

Hortenſ. So it is in every thing, with which we are not acquainted. I think you underſtand the outline of the forms that you may expect to find in leaves, both in their ſimple and compound characters, well enough to enable you to begin the ſtudy of them. We will now conſider, what circumſtances conſtitute a compound leaf. I have ſhewn you in ſpeaking of ſimple leaves, that they continue to be ſo denominated, be their diviſions ever ſo deep, provided thoſe diviſions do not extend to the mid-rib; but when that takes place, the leaf becomes compound; ſo that it is in fact a ſmall branch compoſed of a number of individual leaves, which ſeparate leaves are frequently furniſhed with each a petiole, uniting them to the common petiole, or foot-ſtalk; which, running through the whole, is called the mid-rib. In ſome inſtances it may not to a young botaniſt be

very eaſy to diſtinguiſh a compound leaf from a branch; but there are two rules, by which they may always be known aſunder; 1ſt, buds are never found at the baſe of the lobes, or diviſions of a compound leaf, but are formed in the angle made by the whole with the ſtem, from which it iſſues; 2dly, the branches of woody plants continue, after the leaves are fallen: this never happens with a compound leaf; for, however nearly the common foot-ſtalk, from which it is formed, may reſemble the other in appearance, it always falls off, either with or after the leaves it ſupports.

Charles. Pray, ma'am, are not the leaves of the robínia pſeud-acacia compound? I obſerved them laſt autumn, as they decayed: the common petiole continued ſome time after the leaves were dropped from it; and there was a very ſmall hairy bud at its baſe.

Hortenſ. The leaves of robínia, roſe acacia, afford a good example of the compound character, and alſo of the two rules, that I have juſt now mentioned to you. There are three kinds of compound leaves, the compounded, decompounded, and ſuper-decompounded. The firſt I have explained to you, though there

there be but two diviſions from the ſame common petiole, it is a compound leaf. The terms decompounded, and ſuper-decompounded, are applied to different modifications of the compound leaf; and again theſe modifications admit of ſuch a variety of others, which are diſtinguiſhed each by an appropriate term, that nothing but practice, and the method I recommended in regard to the ſtudy of ſimple leaves, can bring you acquainted with them.

Harr. I will no longer ſay I am afraid of the difficulties, which occur in our ſtudy, ſince, mamma, you have ſhewn me, that ſuch fear ariſes from idleneſs.

Hortenſ. You are very right. Whatever has idleneſs for its ſource, we ought to be aſhamed of, as it is much in our own power to get the better of it. The feathered, footed, winged, paired, are all different forms of the compound leaf; ſo is the fingered, of which you have an example in the horſe-cheſnut, æſculus hippocáſtanum, and lupine, lupínus; as theſe various modes frequently enter into, if not entirely form the ſpecific character of plants, it is neceſſary they ſhould be well underſtood. But, before you attempt the compound leaves,

I adviſe you to become perfectly acquainted with the different forms, which exiſt in the ſimple leaves; as the form of the ſingle leaves, of which the compound leaf conſiſts, is a circumſtance generally noted. The Syſtem of Vegetables, methodically ſtudied, will carry you through this difficult part of botany; or, if ſometimes you are perplexed, an explanation of the ſame terms in other books will be of ſervice to you, as you will probably find different words uſed, which may elucidate the point on which you are in doubt.

Charles. I will acknowledge, ma'am, that, till you ſhewed me the method of ſtudying the Syſtem of Vegetables, I have thought it perfectly unintelligible, when I happened to look into it, as it lay on your table.

Hortenſ. I am not ſurpriſed at this; its excellence can only be underſtood when ſtudied: if taken up as a book to read, it muſt appear a confuſed jargon; and ſuch I have frequently heard it called; but I have convinced ſeveral people of the contrary, who, when they were capable of underſtanding it, have thought as highly of its merits, as I do. To teach botany from any other book is like teaching latin with engliſh on the oppoſite page; the lan-

guage

guage is never completety underſtood, though ſometimes, when judiciouſly uſed, ſuch an aſſiſtance may be advantageous; ſo in botany advantage may be reaped from the more diffuſe explanations of other authors.

Harr. I remember every thing, that I learn from the Syſtem of Vegetables; and now the parts, I have learnt, are quite eaſy to me; and ſometimes Charles hides the engliſh deſcriptions in the London Flora, and I can make out the latin ones very tolerably. When we underſtand the ſpecific differences of plants, I ſhall wiſh, I could read the ſpecies plantárum.

Hortenſ. You may with little trouble learn a ſufficient quantity of latin to enable you to do ſo; and, as all your other ſtudies are ſo well attended to, I ſhall have no objection to it next ſpring, if the deſire then continues.

Harr. Thank you, ma'am; I promiſe you it ſhall not interfere with any more uſeful occupation; and I have no doubt of the deſire being ſtill ſtronger, as my knowledge of botany increaſes.

Hortenſ. We are now to conſider ſome other circumſtances relative to leaves, which it is equally eſſential to underſtand as thoſe, of which we have been treating: theſe are the

determination, or diſpoſition of leaves, which comprehend four particulars alike belonging to the ſimple and compound kind, the *place*, *ſituation*, *direction*, and *inſertion*. By the place, we are to underſtand the particular part of the plant, to which the leaf is attached. Situation regards the reſpective poſition of leaves one to the other: ſo leaves are called alternate, when they come out ſingly, and are ranged gradually on both ſides of the ſtem, as in ivy toad-flax, antirrhinum cymbalaria; or oppoſite, when they come out in pairs, as in myrtle, myrtus, and many other plants. Theſe two circumſtances of leaves being alternate, or oppoſite, furniſh conſtant and invariable characters, which are generally found in plants of the ſame genus, or even of the ſame natural order. Direction contains the different ways, in which a leaf bends from its ſtem, the various modes of its doing ſo are arranged under the general term direction, and muſt be ſtudied to be underſtood. Inſertion comprizes the diverſity of manner, by which leaves may be attached to their parent plants, each of which has an appropriate term, briefly and expreſſively explained in the botanic terms and definitions at the beginning of the Syſtem

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of Vegetables, with plates at the end of each volume to illuſtrate them. I have now only to ſpeak of ſuch flowers, as are commonly called double; to enter far into an account of them belongs rather to the natural hiſtory of plants, than to that part of the ſcience, which ought to engage the attention of a pupil in the beginning of his ſtudies. It will be ſufficient to acquaint you with the unnatural varieties, under which flowers appear, that you may not be miſled by the monſtrous forms, they frequently aſſume, to look for a genus, where there is only a ſportive variety.

Henry. You told me, mamma, that double flowers were monſters, like calves with two heads, or hands with ſix fingers. I one day told the gardener ſo, and he was very angry.

Hortenſ. That was becauſe he did not perfectly underſtand the word monſter, which ſtrictly means only a deviation from the common mode of nature's productions; and thence may ſometimes imply an increaſe of beauty, as at others a departure from it. Double flowers are the pride of a floriſt, as they manifeſt the art of culture; many of them being formed by over luxuriancy of nouriſhment. Gardeners imagine, that by placing

placing a double ſtock-flower near a ſingle one, they can thereby procure ſuch ſeed as will again produce double flowers: but that this is a vulgar error, a very ſlight knowledge of botany may convince us; for, when a flower is completely double, it is deprived of its ſtamens, which commonly expand into petals; by which transformation the flower no longer poſſeſſes the anther-duſt, or eſſential part to the fertilization of ſeeds. There are various ways, in which vegetable monſters are formed, moſt of which generally exclude all, or part of the ſtamens. The unchangeable parts of double flowers are the calyx, and the lower row of petals, by which the genus may be often diſcovered. Some flowers are only half-double; in which caſe the ſtamens and piſtils often remain perfect, and hence produce fruit. This happens in the double peach, the fertility of which is ſometimes brought as an objection to the Linnean ſyſtem.

Juliette. What do you call the roſe in roſe polyanthos, mamma? Is that a double flower?

Hortenſ. It is one kind of the double, or multiplied flowers, and is termed proliferous; of this ſort is the béllis prolífera, hen

and chicken daiſy; this is one of the moſt curious of vegetable monſters, as well as the moſt beautiful, Plantágo roſea, or roſe plantain, is wonderfully diſguiſed by its bracts becoming enlarged, and being converted into leaves. Many flowers become double by the multiplication of their nectaries, and in ſo many various ways, that it would at preſent engage us too long to enumerate them. I will, at a proper time, read to you ſome parts of a tranſlation of Linneus's philoſophy of botany by Mr. Roſe, which will give you information on different parts of the ſubject, for which you are not yet ready.

Harr. I have often looked for the ſtamens in a provence roſe, and could not diſcover them.

Hortenſ. The petals are ſo profuſely multiplied, that they have entirely excluded them. In ſome other roſes, you will find ſtamens, though the flower has a luxuriancy of petals, as in damaſk roſe. The many-petalled flowers are the moſt ſubject to multiplication. The one-petalled rarely go beyond a double corol, which is very often ſeen in them. The compound flowers alſo are liable to become double; and their beauty is often improved by

by it; as daiſie, béllis, ſneez-wort, achilléa, and chryſanthemum ſílphium; but, if we except a few inſtances, I think ſingle flowers are much to be preferred to double ones.

Harr. Roſes, ſtocks, and hyacinths, are much improved by being double; do not you think ſo, mamma?

Hortenſ. The two firſt undoubtedly, and often the laſt. Beſides the varieties occaſioned by multiplication, there are others ariſing from many accidental cauſes; but the moſt general cauſe may be eſteemed culture: it is from the gardener's art, that we receive ſo many delicious fruits and vegetables for our tables; culture too is the teſt, whether a plant be a true ſpecies, or a variety. By a change of ſoil we can produce the moſt valuable varieties, or oblige them to return to their original form; by refuſing them our nouriſhing care. The ingenuity and induſtry of mankind is not ſeen in any thing more conſpicuouſly than in his culture of corn, which, without the ſcience of agriculture, would be of ſmall value; with it, we muſt eſteem it the firſt bleſſing of life. Botaniſts are careful to diſtinguiſh between varieties obtained from ſeed, and the genuine ſpecies, from which they deviate. Such plants

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you will not find noted in the Syſtem of Vegetables, which contains only the génera, and the permanent ſpecies: in the Species Plantarum, the varieties are diſtinguiſhed by a capital B being placed immediately before the deſcriptions of them. What I explained to you reſpecting the changes, which take place in the fructification of plants, is equally applicable to leaves, and to every other part of them; by which they are frequently ſo metamorphoſed, that it requires no ſmall degree of botanical knowledge to aſcertain the real plant. Many of theſe appearances may be effected by art, and have been ſo by the curious, in order to diſcover the true cauſe of ſuch deformities, or of diſeaſes, which are found deſtructive of vegetation.

Harr. That will be the laſt part of botany, I ſhall be deſirous of inveſtigating.

Hortenſ. Thoſe ſtudies are certainly the moſt agreeable, which lead to the diſcovery of beauties, rather than of defects. No ſcience can be more productive of ſuch diſcoveries than botany. You have now gone through the various parts of the Linnean ſyſtem, and may be ſaid to underſtand it well in the outline. The remainder of the ſummer will afford ample

ample time for you to become proficients in the filling up of this outline, and the finer ſtrokes, which can only be underſtood by practical ſtudy: by attention to that you will render all your walks doubly agreeable.

Harr. We have already found this, mamma, and often ſay to each other, how much we are obliged to you for having taught us to reflect. Whatever we ſee gives us pleaſure; while ſome of our companions are always wiſhing for new proſpects, or any variety; ſometimes Mrs. Pratt recommends to them to ſtudy natural hiſtory, and attempts to ſhew them the different parts of a flower, or the beauties of a butterfly; but they ſay, that they have enough to learn at home, and only bear walking out, becauſe they eſcape leſſons during that time.

Hortenſ. The young ladies, to whom you allude, are not fortunate in their preceptors, who endeavour to force knowledge upon them, inſtead of leading them to ſeek it. The great object of education is to render our pupils happy, and to make them uſeful and agreeable members of ſociety. If I attain theſe objects, I ſhall think all my cares rewarded; and I flatter myſelf, that I ſee good ſecurity,

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in the diſpoſitions of you all, that I ſhall do ſo.—We may at preſent lay aſide our regular lectures. In another year you will be equal to the ſtudy of the moſt agreeable branch of the botanical ſcience—that which may be called the philoſophy of it. Meanwhile the knowledge that we have already acquired of the mechaniſm of plants, and of the proviſion made by nature for their preſervation, is ſufficient to lead us with grateful praiſe to God, the firſt great cauſe of all; to whom we cannot fail to cry out, with hearts exulting with the delightful ſenſations of gratitude, "The heavens declare thy glory, O God, and the firmament ſheweth thy handy work! Manifold are thy works, O Lord, in wiſdom haſt Thou made them all!"

THE END.

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